FURUNO

# OPERATOR'S MANUAL

*MARINE RADAR*

MODEL
**FCR-2107**
**FCR-2107-BB**
**FCR-2107-D**
**FCR-2807**
**FCR-2807-D**

FURUNO ELECTRIC CO., LTD.

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**ECF**

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

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# Important Notices

## General

- The operator of this equipment must read and follow the descriptions in this manual. Wrong operation or maintenance can cancel the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will cancel the warranty.
- All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

## How to discard this product

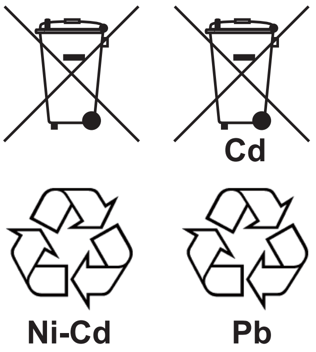
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

## How to discard a used battery

Some FURUNO products have a battery(ies). To see if your product has a battery, see the chapter on Maintenance. Follow the instructions below if a battery is used. Tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

### In the European Union

The crossed-out trash can symbol indicates that all types of batteries must not be discarded in standard trash, or at a trash site. Take the used batteries to a battery collection site according to your national legislation and the Batteries Directive 2006/66/EU.




### In the USA

The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.

### In the other countries

There are no international standards for the battery recycle symbol. The number of symbols can increase when the other countries make their own recycling symbols in the future.

# ⚠ SAFETY INSTRUCTIONS

The operator must read the applicable safety instructions before attempting to operate the equipment.

| | |
|---|---|
| ⚠ WARNING | Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. |
| ⚠ CAUTION | Indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury. |

⚠ Warning, Caution    ⊘ Prohibitive Action    ❗ Mandatory Action

## ⚠ WARNING

### Radio Frequency Radiation Hazard

The radar antenna emits electromagnetic radio frequency (RF) energy which can be harmful, particularly to your eyes. Never look directly into the antenna aperture from a close distance while the radar ius in operation or eexpose yourself to the transmitting antenna at a close distance. Distances at which RF radiation level of 100, 50 and 10 W/$m^2$ are given in the table below.

**Note:** If the antenna unit is installed at a close distance in front of the wheel house, your administration may require halt of transmission within a certain sector of antenna revolution. This is possible. Ask your FURUNO representive or dealer to provide this feature.

| Radar model | Transceiver | Magnetron | Antenna *1 | 100W/$m^2$ | 50W/$m^2$ | 10W/$m^2$ |
|---|---|---|---|---|---|---|
| FCR-2117(-BB,-D)<br>FCR-2817(-D) | RTR-078 | MG4010*2 | XN20AF | 0.1m | 0.7m | 2.2m |
| | | | XN24AF | 0.1m | 0.4m | 1.5m |
| FCR-2127(-BB,-D)<br>FCR-2827(-D) | RTR-079 | MG5436 | XN20AF | 0.5m | 1.7m | 4.6m |
| | | | XN24AF | 0.2m | 1.0m | 3.3m |
| FCR-2137S(-BB,-D)<br>FCR-2837S(-D) | RTR-080 | MG5223F | SN30AF | 0.1m | | 2.4m |
| | | | SN36AF | 0.1m | 0.7m | 2.0m |
| FCR-2827W(-D) | RTR-081 | MG5436 | XN20AF | 0.4m | 1.0m | 5.6m |
| | | | XN24AF | 0.2m | 0.5m | 3.4m |
| FCR-2837SW(-D) | RTR-082 | MG5223F | SN36AF | - | 0.2m | 1.9m |

*1 XN12AF: 120cm, XN20AF: 198cm, XN24AF: 243cm, SN30AF: 309cm, SN36AF: 377cm
*2 OR MAF1425B

## ⚠ WARNING

**Do not subject the units other than the antenna unit to rain or water splash.**

Fire or electrical shock can result if water gets inside the equipment.

**Do not disassemble or modify the equipment.**

Fire or electrical shock can result if the equipment is modified.

**Do not place liquid-filled containers on the top of either processor unit.**

Fire or electrical shock can result if a liquid spills into a processor unit.

**Do not operate the equipment with wet hands.**

Electrical shock can result.

**Make sure no is near the antenna unit before turning on the radar.**

Serious injury or death can result if someone is struck by a rotating radar antenna.

**Turn off the power immediately at the switchboad if water leaks into the equipment or the equipment is emitting smoke or fire.**

Continued use of the equipment can cause fire or electrical shock.

**Do not open the equipment.**

Only qualified personnel should work inside the equipment.

## ⚠ WARNING

**Do not leave ropes or other objects in the vicinity of the antenna unit.**

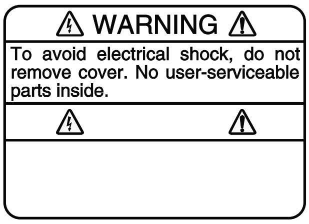
Fire, electrical shock or injury can result if an object becomes entangled in the antenna unit.

**Use the correct fuse.**

Use of an incorrect fuse can causes fire or serious damage to the equipment.

## Warning Labels

Warning labels are attached to the equipment. Do not remove any label. If a label is missing or damaged, contact a FURUNO agent or dealer about replacement.




Name: Warning Label 1
Type: 86-003-1011-1
Code No.: 100-236-231

Name: Warning Sticker
Type: 3-142-3201-0
Code No.: 100-266-890

## ⚠ WARNING

**No one navigational aid should be relied upon for the safety of vessel and crew. The navigator has the responsibility to check all aids available to confirm position. Electronic aids are not a substitute for basic navigational principles and common sense.**

- This TT automatically tracks automatically or manually acquired radar targets and calculates their courses and speeds, indicating them by vectors. Since the data generated by the auto plotter are based on what radar targets are selected, the radar must always be optimally tuned for use with the auto plotter, to ensure required targets will not be lost or unwanted targets such as sea returns and noise will not be acquired and tracked.

- A target does not always mean a land-mass, reef, ships or other surface vessels but can imply returns from sea surface and clutter. As the level of clutter changes with environment, the operator should properly adjust the A/C SEA, A/C RAIN and GAIN controls to be sure target echoes are not eliminated from the radar screen.

## ⚠ CAUTION

**The plotting accuracy and response of this TT meets IMO standards.**
**Tracking accuracy is affected by the following:**

- Tracking accuracy is affected by course change. One to two minutes is required to restore vectors to full accuracy after an abrupt course change. (The actual amount depends on gyrocompass specifications.)
- The amount of tracking delay is inversely proportional to the relative speed of the target. Delay is on the order of 15—30 seconds for high relative speed; 30—60 seconds for low relative speed.
- Display accuracy is affected by the following:
  - Echo intensity
  - Radar transmission pulsewidth
  - Radar bearing error
  - Gyrocompass error
  - Course change (own ship and target)

**The data generated by TT and AIS are intended for reference only.**

Use all available navigation aids to determine the position of other vessels.

**No one navigation device should ever be solely relied upon for the navigation of the vessel.**

Always confirm position against all available aids to navigation, for safety of vessel and crew.

**A radar is useful as an anti-collision aid. However, it does not remove the requirement for maintaining a vigilant watch.**

Always maintain a vigilant watch while underway.

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# Foreword

Congratulations on your choice of the FURUNO FCR-2107(-BB,-D), FCR-2807(-D) Series Marine Radar/ARPA(TT). We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

For over 60 years FURUNO Electric Company has enjoyed an enviable reputation for innovative and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless installed, operated and maintained properly. Please carefully read and follow the recommended procedures for operation and maintenance.

## Features

This radar series meets the requirements in IEC62388 (Marine navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, method of testing and required test results) and IMO MSC.192(79), IMO Resolution A.817(19), and IEC 61174. This radar displays radar targets, electronic charts, nav lines, Tracked Target (TT) data, AIS targets and other navigation data on a high-resolution 19-inch (FR-2107-D), 20.1-inch display (FCR-21x7(-BB) or 23.1-inch display (FCR-28x7(-D)). Blackbox configuration also is available in the FCR-2107 series.

The main features of this series are

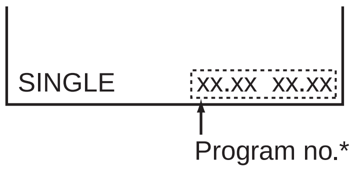
- Radar, ECDIS and chart radar modes. (The chart radar mode is optional, and it does not meet the criteria for navigation aid for Japanese flag vessels as defined by Japanese law.)
- The FCR-2107(-BB,-D), FCR-2807(-D) series consists of the following models and configurations:

<table>
<tr><th>Model</th><th>Frequency Band</th><th>Display</th><th>Output Power</th><th>Transceiver location</th></tr>
<tr><td>FCR-2117(-D)</td><td rowspan="7">X-band</td><td rowspan="2">20.1"</td><td>10 kW</td><td rowspan="6">In antenna unit</td></tr>
<tr><td>FCR-2127(-D)</td><td>25 kW</td></tr>
<tr><td>FCR-2817(-D)</td><td rowspan="2">23.1"</td><td>10 kW</td></tr>
<tr><td>FCR-2827(-D)</td><td>25 kW</td></tr>
<tr><td>FCR-2117-BB</td><td rowspan="2">Local supply</td><td>10 kW</td></tr>
<tr><td>FCR-2127-BB</td><td>25 kW</td></tr>
<tr><td>FCR-2827W(-D)</td><td>23.1"</td><td>25 kW</td><td>Transeiver unit</td></tr>
<tr><td>FCR-2137S(-D)</td><td rowspan="4">S-band</td><td>20.1"</td><td rowspan="4">30 kW</td><td rowspan="2">In antenna unit</td></tr>
<tr><td>FCR-2837S(-D)</td><td rowspan="2">23.1"</td></tr>
<tr><td>FCR-2837SW(-D)</td><td>Transceiver unit</td></tr>
<tr><td>FCR-2137S-BB</td><td>Local supply</td><td>In antenna unit</td></tr>
</table>

- Continuous monitoring of ship’s position through multi-sensor Kalman filter processing using GPS, DPGS, SDME
- Route planning and route monitoring facilities
- Wide variety of warning facilities contribute to safer and more efficient navigation
- Grounding warnings, safe depth contours
- Chart database loaded and updated using CD-ROMs
- Tracked Target (TT) data and AIS transponder to aid collision avoidance
- Sharing of route with ECDIS

# Program Number

The program number appears at the right-hand side of the display.




*The program no. is shown as "xx.xx xx.xx" in this manual because of regular program modification.

| Device | Program no. | Date of Modification |
|---|---|---|
| Chart Processor | 06.xx | 10/2010 |
| Radar Processor | 03.xx | 08/2010 |

xx=Minor modification

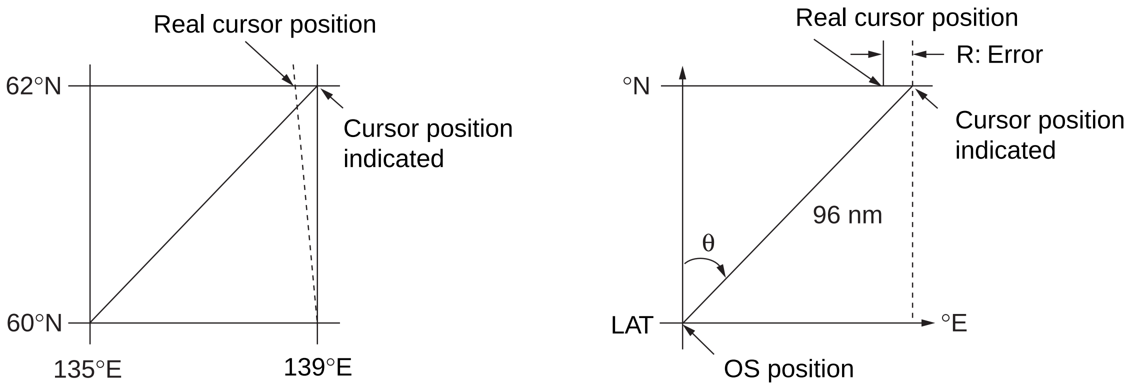
# Signal Processing Functions

This radar has the signal processing functions described in the table below. All signal processing functions are set with the Picture feature. See section 2.22 Automatic Picture Setup According to Navigation Purpose.

| Signal processing function | Description | Section |
|---|---|---|
| Interference rejector | Suppress interference transmitted by other radars. Interference received simultaneously from many radars can be difficult to reduce. | 2.10 |
| Echo stretch | Enlarge target echoes, especially small echoes. Suppress interference, sea clutter and rain clutter before using echo stretch, to prevent the enlargement of unwanted echoes. | 2.17 |
| Echo averaging | The radar samples echoes with each scan. Targets that show a large change with each scan are judged as clutter and are reduced to display only echoes from legitimate targets. | 2.18 |
| Noise rejector | Suppress white noise and increase the S/N ratio to improve picture clarity. | 2.23 |

# Longitude Error Table (on 96 nm range scale)

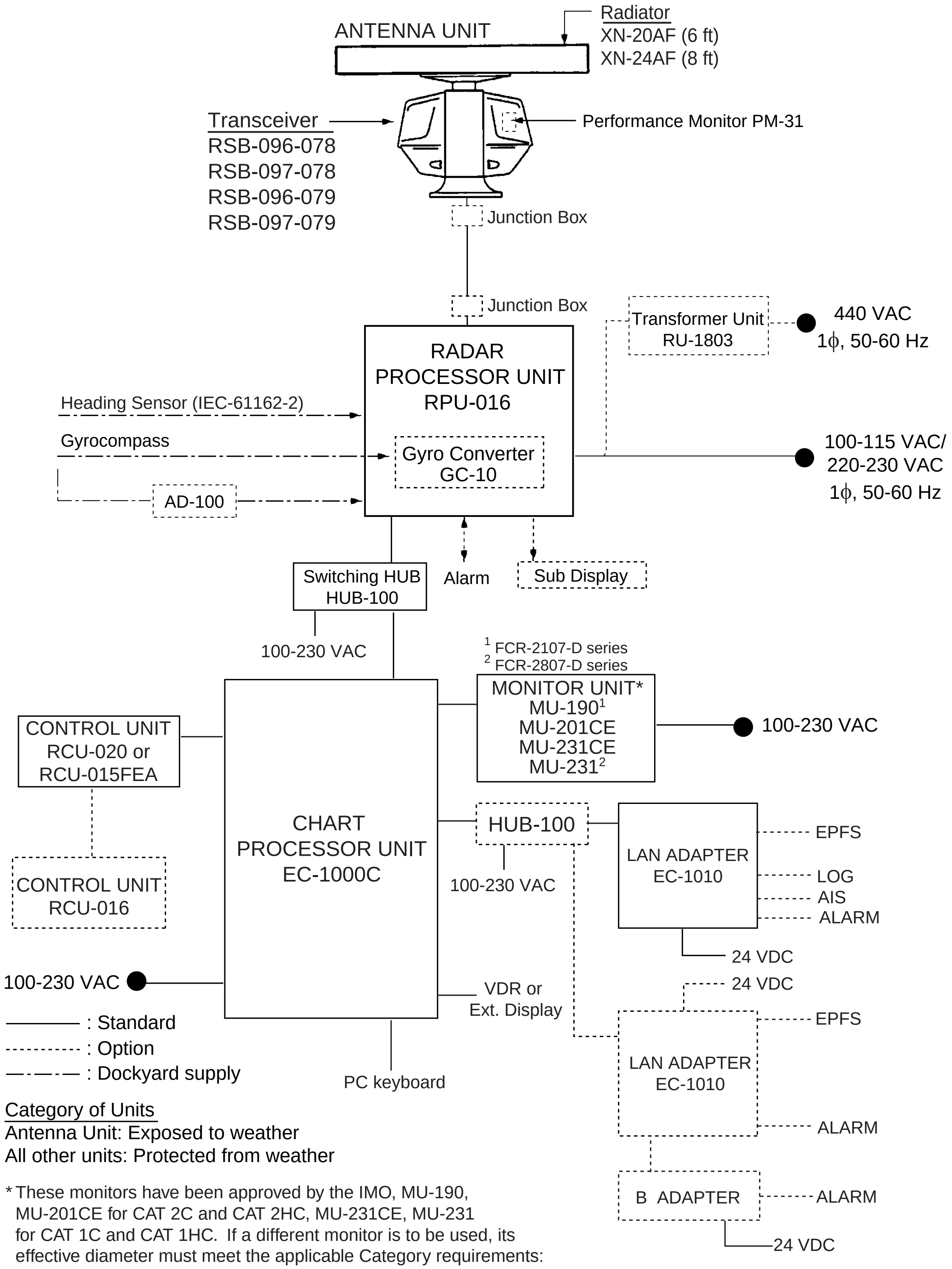
The longitude lines concentrate on the north pole and south pole, namely, 1 nm is equivalent to 1 minute at 0 degree latitude, 2 minutes at 60 degrees latitude, 3 minutes at 70 degrees latitude and so on. For this reason, a longitude error occurs on the radar display. For example, when own ship is at 60°N and 135°E, even if the cursor indication is 62°N and 139°E, the real cursor position is deviated to the left (west) side. The table below shows the longitude error, represented from 0° to 90° at 96 nm from the radar center (own ship).




*Distance error in direction of longitude due to latitude*

# System Configuration

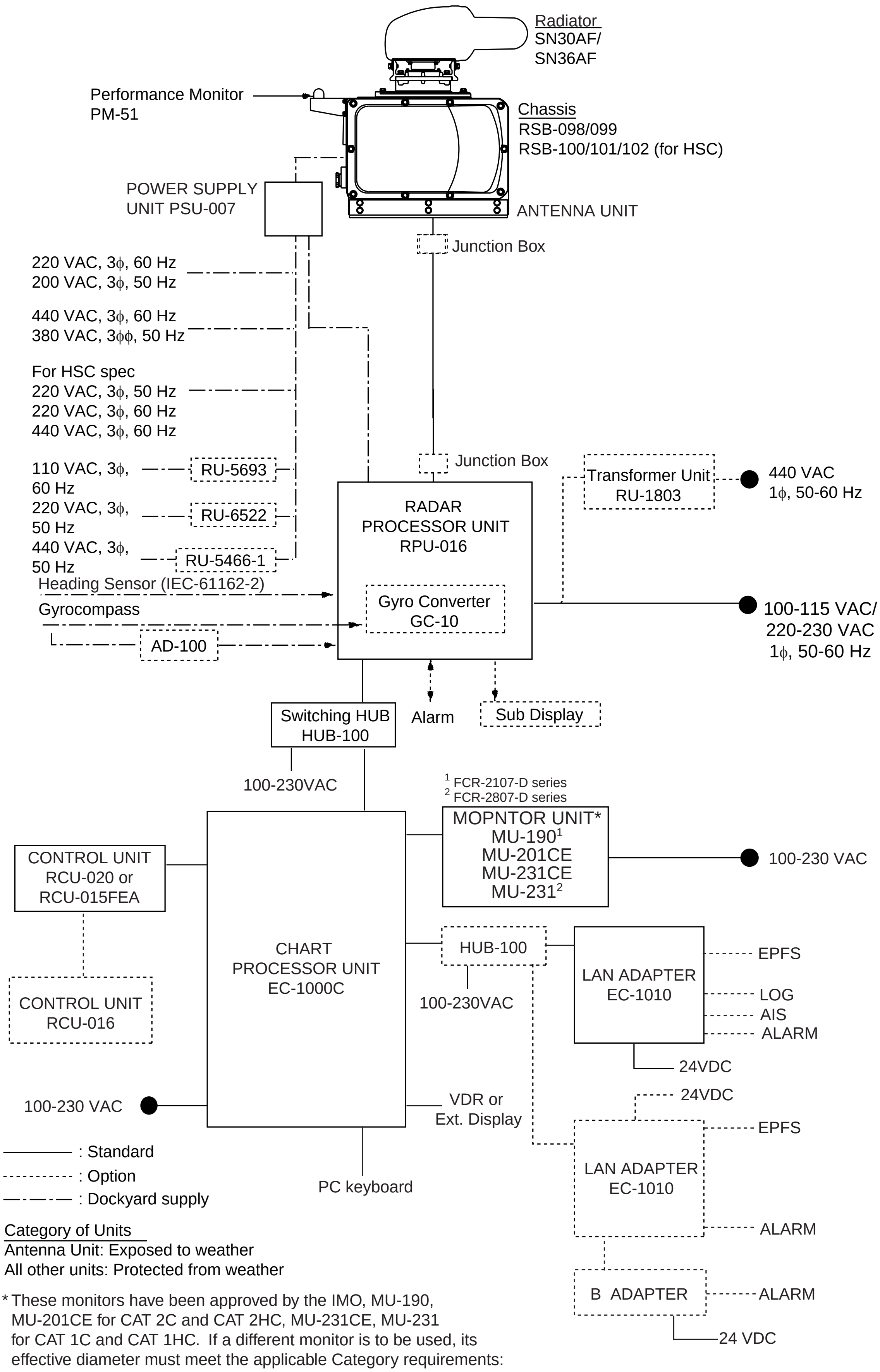
## FCR-2117(-BB,-D)/2127(-BB,-D)/2817(-D)/2827(-D)




Category of Units
Antenna Unit: Exposed to weather
All other units: Protected from weather

* These monitors have been approved by the IMO, MU-190, MU-201CE for CAT 2C and CAT 2HC, MU-231CE, MU-231 for CAT 1C and CAT 1HC. If a different monitor is to be used, its effective diameter must meet the applicable Category requirements:
CAT 1C and CAT 1HC: effective diameter 320 mm or higher
CAT 2C and CAT 2HC: effective diameter 250 mm or higher
For installation, operation and viewing distance of other monitor, see its manuals.

## FCR-2137S(-BB,-D)/2837S(-D)

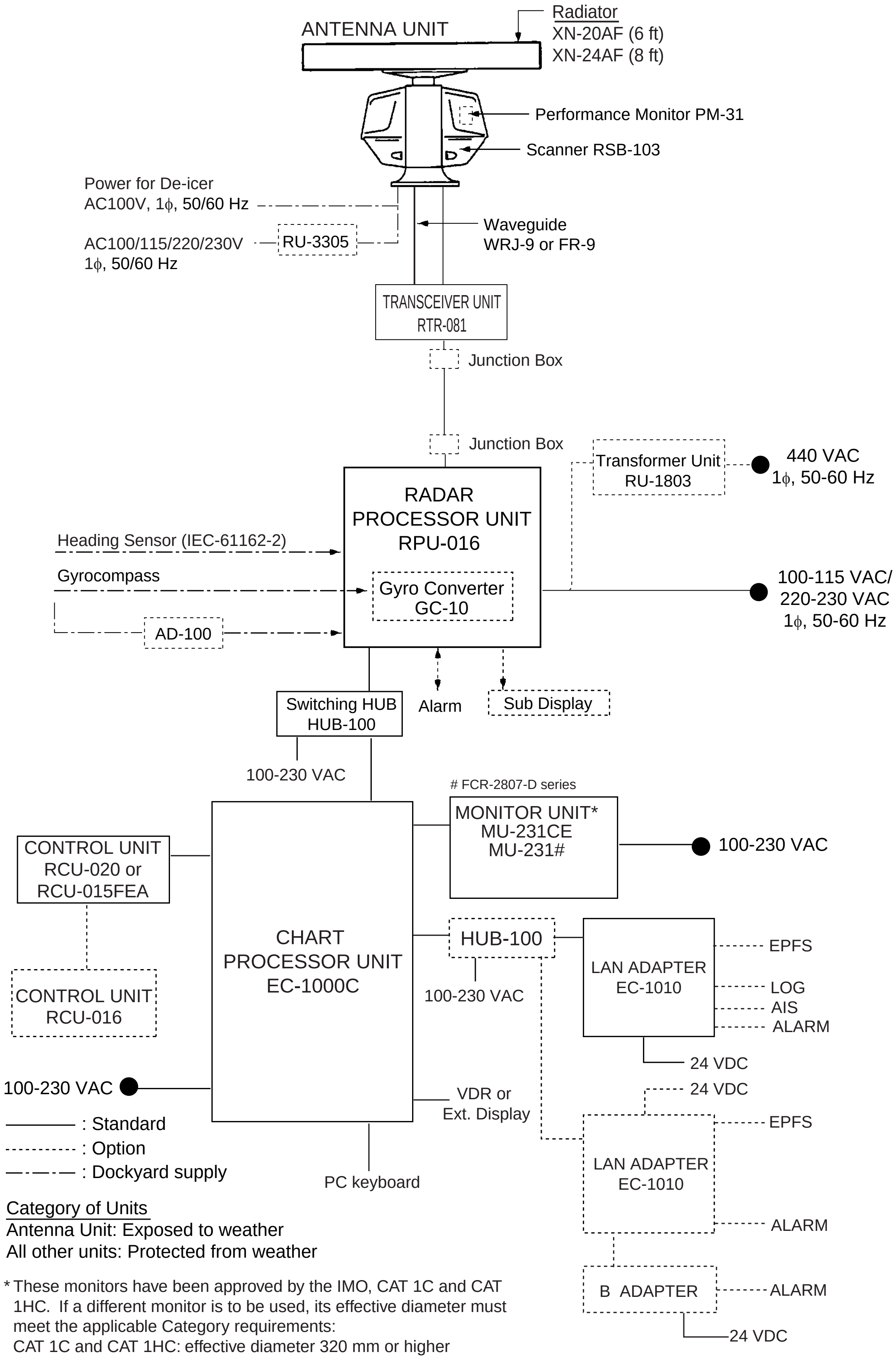



——— : Standard
- - - - : Option
—·—·— : Dockyard supply

Category of Units
Antenna Unit: Exposed to weather
All other units: Protected from weather

*These monitors have been approved by the IMO, MU-190, MU-201CE for CAT 2C and CAT 2HC, MU-231CE, MU-231 for CAT 1C and CAT 1HC. If a different monitor is to be used, its effective diameter must meet the applicable Category requirements:
CAT 1C and CAT 1HC: effective diameter 320 mm or higher
CAT 2C and CAT 2HC: effective diameter 250 mm or higher
For installation, operation and viewing distance of other monitor, see its manuals.

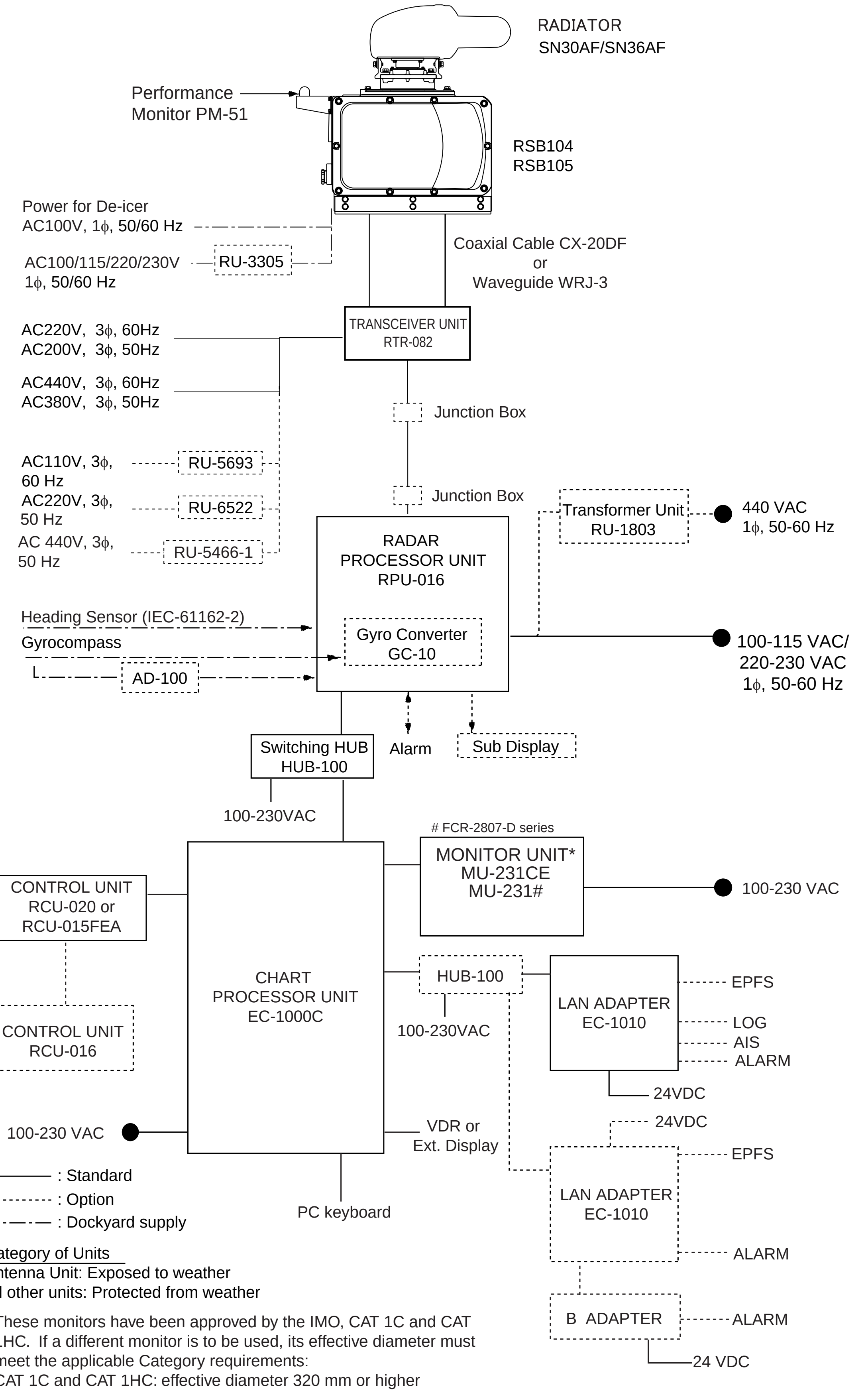
## FCR-2827W(-D)




Category of Units
Antenna Unit: Exposed to weather
All other units: Protected from weather

* These monitors have been approved by the IMO, CAT 1C and CAT 1HC. If a different monitor is to be used, its effective diameter must meet the applicable Category requirements:
CAT 1C and CAT 1HC: effective diameter 320 mm or higher
CAT 2C and CAT 2HC: effective diameter 250 mm or higher
For installation, operation and viewing distance of other monitor, see its manuals.

# FCR-2837SW(-D)




——— : Standard
- - - - : Option
—·—·— : Dockyard supply

Category of Units
Antenna Unit: Exposed to weather
All other units: Protected from weather

* These monitors have been approved by the IMO, CAT 1C and CAT 1HC. If a different monitor is to be used, its effective diameter must meet the applicable Category requirements:
CAT 1C and CAT 1HC: effective diameter 320 mm or higher
CAT 2C and CAT 2HC: effective diameter 250 mm or higher
For installation, operation and viewing distance of other monitor, see its manuals.

# 1. Operational Overview

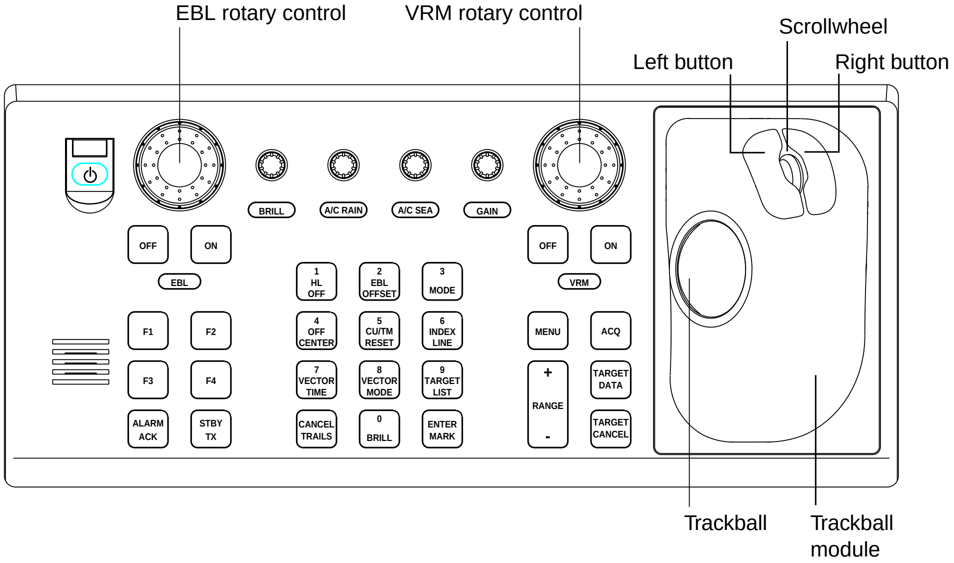
## 1.1 Units of the System

### 1.1.1 Control units

Two types of control units are available: Control Unit RCU-020 (full keyboard) and Control Unit RCU-015 (palm control).

#### *Control unit RCU-020*

The Control Unit RCU-020 consists of a keyboard and a trackball module (trackball, scrollwheel and left and right buttons). The trackball module functions like a mouse; the user rolls the trackball and operates the left and right buttons and the scrollwheel to access functions.



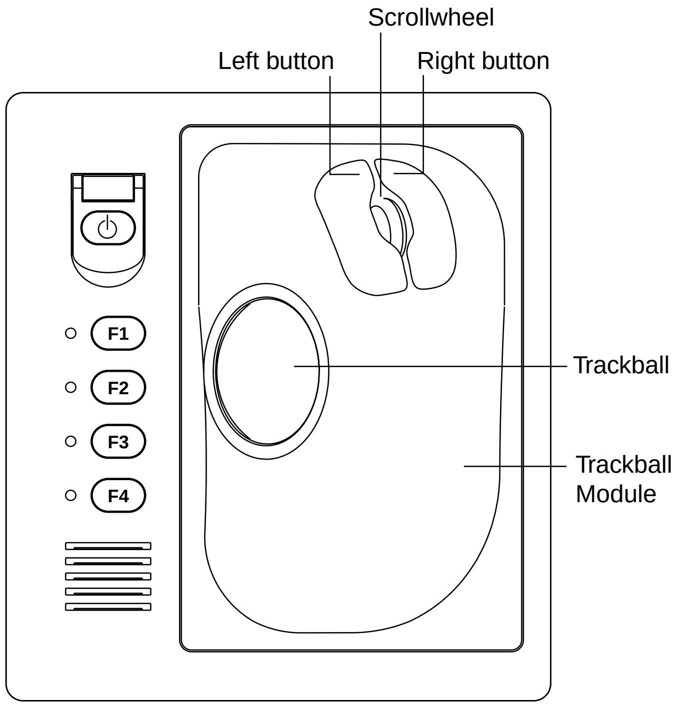

*Control unit RCU-020 (full keyboard)*

| Key | Description |
|---|---|
| POWER | Turns the system on/off. (This control does not switch the display on/off.) |
| BRILL | Adjusts display brilliance. (FURUNO monitor only) |
| VRM rotary encoder | Adjust active VRM. |
| VRM ON | Activates and displays VRM 1 if none is displayed or VRM2 is active.<br>Activates and displays VRM 2 if VRM1 is active. |
| VRM OFF | Inactivates and erases VRM 1 if both VRMs are displayed.<br>Inactivates and erases VRM 2 if VRM1 is active. |
| EBL rotary encoder | Adjusts active EBL. |
| EBL ON | Activates and displays EBL1 if none is displayed or EBL 2 is active.<br>Activates and displays EBL 2 if EBL1 is active. |
| F1 – F4 | User programmable macro keys. |
| ALARM ACK | Alarm acknowledgement for alerts generated by chart, navigation or steering calculation. |
| STBY TX | Toggles radar between standby and TX. |
| GAIN | Adjusts radar gain. |
| A/C RAIN | Reduces rain clutter. |
| A/C SEA | Reduces sea clutter. |
| HL OFF | Temporarily erases heading line. |
| EBL OFFSET | Shifts EBL point of origin/returns point of origin to screen center. |
| MODE | Selects presentation mode. |
| OFF CENTER | Locates own ship on-screen position where desired; returns own ship position to screen center. |

| | |
|---|---|
| CU/TM RESET | In the true motion mode, own ship is shifted 75% of the display radius in the stern direction. In the course-up mode, the heading line is returned to 0°. |
| INDEX LINE | Enables/disables parallel index lines. |
| VECTOR TIME | Sets vector time (length) for TT (TT). |
| VECTOR MODE | Selects vector mode, true or relative. |
| TARGET LIST | Display TT AIS target list. |
| CANCEL TRAILS | Sets echo trail time. Also functions to cancel data input. |
| ENTER MARK | Terminate input in menu; display MARK dialog box. |
| MENU | Opens/closes main menu. |
| RANGE | Selects radar range. |
| ACQ | Acquires trackball-selected TT. |
| TARGET DATA | Displays data for trackball-selected TT and AIS. |
| TARGET CANCEL | Cancels tracking on trackball-selected TT and AIS. |

### *Control unit RCU-015*

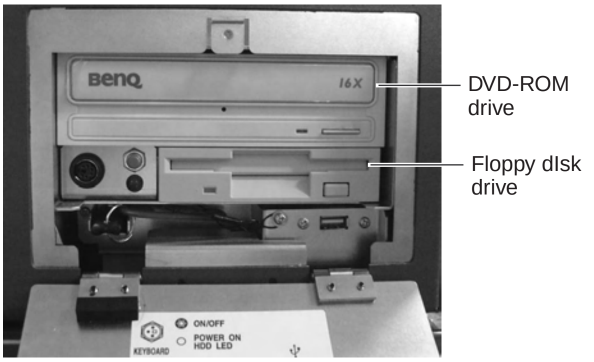
The Control Unit RCU-015 has a power switch, trackball module (trackball, scrollwheel and left and right mouse buttons) and four user-programmable function keys. The trackball module functions like a mouse; the user rolls the trackball and operates the left and right buttons and the scrollwheel to access functions.



### 1.1.2 Chart processor unit

The chart processor unit is responsible for the loading, storing, updating and processing of electronic sea charts, with the DVD-ROM drive or floppy disk drive. The DVD-ROM and floppy disk drives are behind the lid on the front panel.

**Note:** Do not operate the ECDIS with a media (FD/CD/DVD) inserted in its drive, to prevent damage to the drive and media. Remove media from its drive after usage. Insert media only to do operations such as backing up data, updating charts, and the like. After completion, remove the media from its drive and store it in its case, **BEFORE** using the ECDIS. Store media out of direct sunlight, in a place where temperature and humidity are moderate and stable.




## 1.2 How to Turn the Power On/Off

Normally, leave the power switch at the rear of the chart processor on and control power on/off with the **POWER** key on a control unit. Note that the display unit is powered independently.

After power is applied, the Windows program starts up and about one minute later the bearing scale appears. The radar then goes into three minutes of warm-up time to warm the magnetron, which transmits radar pulses. The timer counts the time remaining for warm-up. When the timer has reached 0:00, the indication "ST-BY" appears at the screen center, meaning the radar is now ready to transmit pulses.

In the stand-by condition, markers, rings, map, charts, etc. are not shown. Further, neither TT nor AIS is active.

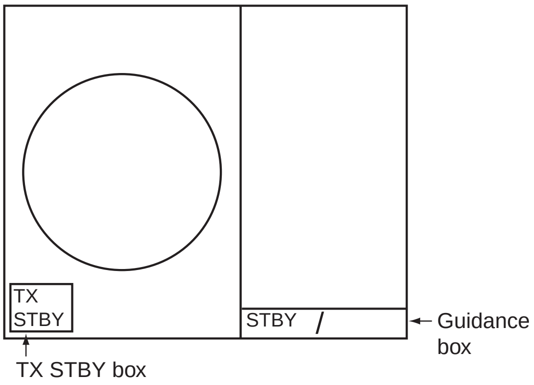
If the power is reapplied after the equipment was in the ECDIS mode, Windows starts up and about two minutes later the ECDIS display appears.

Parameters set on the menus are stored in a non-volatile memory (hard disk) and are preserved when the power is turned off.

**Note:** If the ambient temperature is less than 0°C (32°F) when the power is applied, nothing appears on the display. This is because the heater is warming the chart processor unit. The display appears in approx. 10 minutes.

### *Transmitter ON*

After the power is turned on and the magnetron has warmed up, ST-BY appears at the screen center, meaning the radar is ready to transmit radar pulses. You can transmit by pushing the **STBY/TX** key on the full keyboard, or use the trackball to select the TX STBY box at the bottom left corner of the display then push the left button. The label at the left-hand side of the guidance area at the bottom right corner of the screen changes from TX to STBY.




The radar is initially set to previously used range and pulse length. Other settings such as brilliance levels, VRMs, EBLs and menu option selections are also set to previous settings.

The **STBY/TX** key (or TX STBY box) toggles the radar between STBY and TRANSMIT state. The antenna stops in stand-by and rotates in transmit. The magnetron ages with time resulting in a reduction of output power. Therefore, it is highly recommended that the radar be set to stand-by when not used for an extended period of time.

### Picture freeze

If the picture freezes the picture is not updated. 30 seconds after the picture freezes, the buzzer sounds, the **ALARM ACK** key blinks and alarm contact signal is output. Reset the power to restore normal operation.

### How to stop antenna rotation

Antenna rotation can be stopped. One method is to turn off the antenna switch on the radar. The other method is to stop rotation from the menu. For how to stop rotation from the menu, see the installation manual.

### About on-screen boxes and indications

The on-screen boxes, like the TX STBY box, provide for adjustment of the item that appears on their labels. Some indications also function to provide adjustment of a specific function. When you put the cursor inside a box or on an indication, the color of the label in the box or the indication changes (example: yellow to green). This indicates that the box or indication is correctly selected. Then, you can change setting by pushing the left button.

## 1.3 Monitor Brilliance

The brilliance of the entire screen should be adjusted according to lighting conditions. Monitor brilliance should be adjusted before adjusting relative brilliance levels on the BRILL menu.

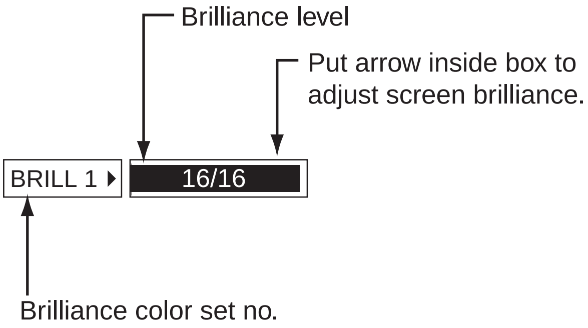
**Note:** The brilliance of a commercial monitor cannot be adjusted from the radar. See the owner's manual of the commercial monitor for how to adjust its brilliance.

### How to adjust brilliance with the keyboard-equipped control unit

Operate the **BRILL** control to adjust brilliance. Turn it clockwise to increase brilliance; counterclockwise to decrease brilliance. Watch the BRILL box (see illustration below) to know current brilliance level.

### How to adjust brilliance with the trackball

1. Use the trackball to place the arrow on the brilliance level indicator in the BRILL box at the bottom left corner of the screen.



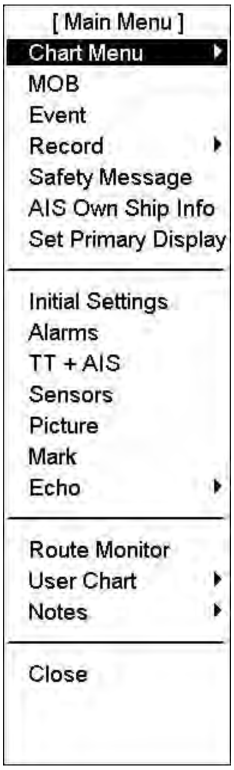

*BRILL box*

2. Spin the scrollwheel downward to increase brilliance or spin it upward to decrease brilliance. The length of the brilliance bar increases or decreases with operation of the scrollwheel.

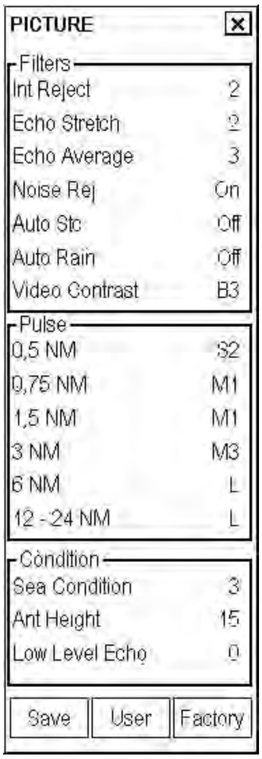
**Note:** If nothing appears on the screen at power-up when using Control Unit RCU-015 (palm control) or when the radar is in stand-by, push and hold down any key except the power switch for four seconds to automatically set up for medium display brilliance.

## 1.4 Menu Operation

There are two main menus, radar/chart radar and ECDIS, and the one currently available depends on operating mode. You can access the main menu from the full keyboard or by using the trackball. In later sections only the procedure for operation by trackball is given. In the example below the menu operating procedure for operation on the radar/chart radar main menu is presented.




*Main menu*




*PICTURE dialog box*

1. Do one of the following depending on the control unit you are using.
   - **Control unit RCU-020:** Push the **MENU** key to show the Main menu.
   - **Control unit RCU-015 (or RCU-020):** Use the trackball to select the MENU box at the right side of the screen then push the left button to show the Main menu, shown left.
2. Use the trackball to select desired menu then push the scrollwheel to open the menu selected. For example, select Picture to show the PICTURE dialog box, shown left.
3. Use the trackball to put the cursor on the setting of the item you wish to change. The setting changes color to indicate it is selected. (The color depends on the color arrangement in use.)
4. Spin the scrollwheel to select setting desired then push it or the left button to confirm setting.
5. Push the right button to close the menu. (Several pushes may be necessary depending on the menu used. In some cases you will click the Close window button (X) at the top right corner on the menu.)

**Note:** Hereafter, for sake of brevity, we state "push the scrollwheel" in cases where you can push either it or the left button.

### *How to enter data*

Alphanumeric data can be changed by selecting it with the cursor then pushing the left button. (This action also displays minimum and maximum values beside the input field.) Spin the scrollwheel to select value then push it to confirm setting. (Alphanumeric data may also be entered directly from the keyboard-equipped control unit.)

To change a specific alphanumeric character, use the trackball to put the cursor to the left of the digit or character that you want to change and spin the scrollwheel to select appropriate character.

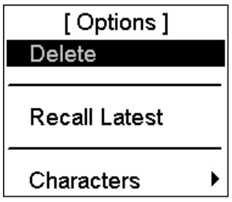
### *How to change co-ordinate polarity (available in the ECDIS mode)*

#### By clicking co-ordinate polarity

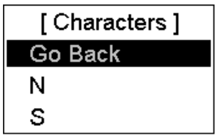
1. Put the cursor before the co-ordinate (N, S, E, W) then push the left button.
2. Spin the scrollwheel to select desired polarity then push the scrollwheel.

#### By choosing polarity from drop-down menu

1. Put the cursor inside the input window.
2. Push the right button to show the following menu.



3. Select Characters then push the left button. Your screen should now look something like the one below. (In case of longitude, E and W replace N and S.)

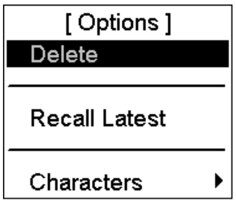



4. Spin the scrollwheel to select appropriate polarity then push the scrollwheel. The polarity is changed and the window is closed.

### *How to delete a character*

A character can be deleted from a text/numeric input field as follows:

1. Put the cursor to the right of the digit you want to delete then push the right button.




2. Delete is selected; push the scrollwheel to delete the alphanumeric selected. The character is deleted and the window is closed.

# 1.5 The Trackball Module

The trackball module, as shown on pages 1-1 and 1-2, consists of the trackball, right and left mouse buttons and the scrollwheel.

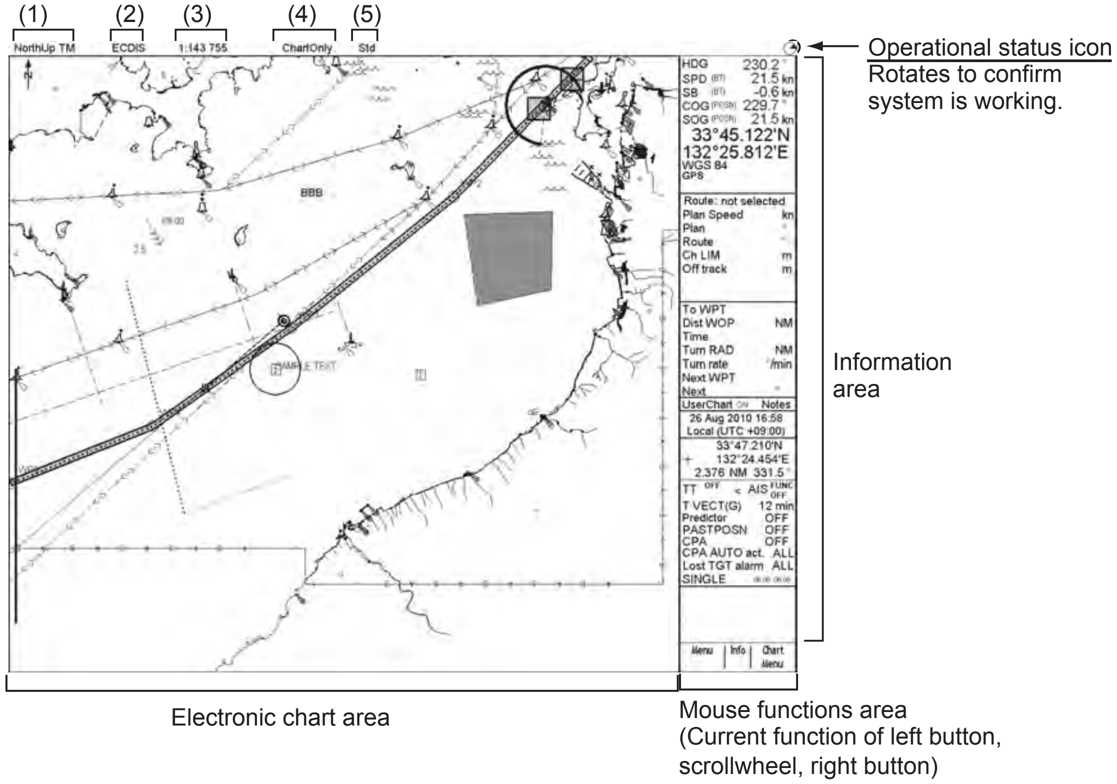
## 1.5.1 The scrollwheel

### *How to control items with the scrollwheel*

Selections can be made on the screen by pointing on the screen with the cursor then scrolling various options with the scrollwheel. When you put the cursor on text or numeric, it turns green, purple or blue (depending on Palette in use) to indicate that the scrollwheel can be used to scroll options or change value. Confirm your selection by pushing the scrollwheel.

The following items can be adjusted directly on the screen in the ECDIS mode.

(1) Presentation mode
(2) ECDIS mode
(3) Display scale
(4) Chart only switch
(5) Name of display settings (DspBase, PartStd, Std, Other, AllOther)*



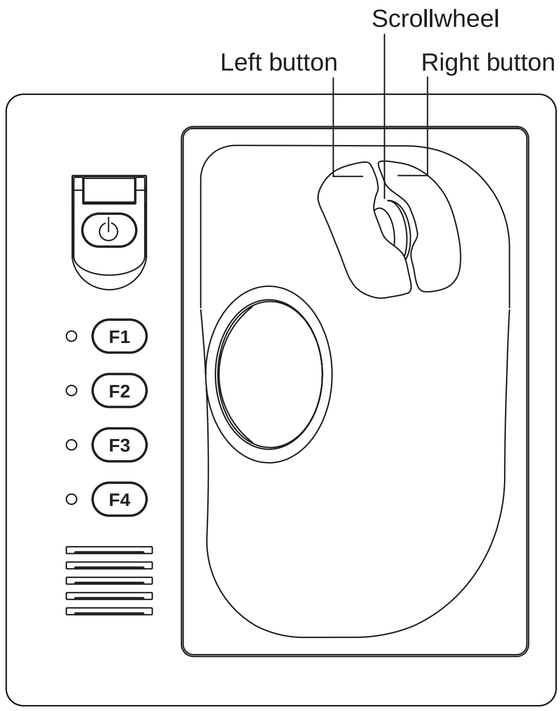

*DspBase: When no options are checked on Standard page.
PartStd: When some of options (not all) are checked on Standard page.
Std: When all options are checked on Standard page and no options are checked on Other1/Other 2 pages.
Other: When all options are checked on Standard page and some options (not all) are checked on Other1/Other2 pages.
AllOther: When all options are checked on Standard page and all options are checked on Other1/Other2 pages.

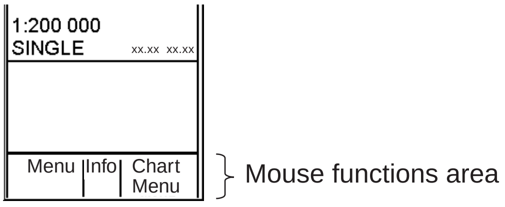
The procedure below shows you how to change the presentation mode from North Up TM to Course Up RM.

1. Put the cursor on the text at the location shown by "1." in the figure above, and the color of the text changes from current color to green.
2. Use the scrollwheel to scroll options until Course Up RM appears. As you scroll, the color of the text changes to magenta, blue or green depending on the Palette in use.
3. Push the scrollwheel to confirm your selection, and the color of the text becomes green. When you move the cursor away from the text, the color of the text returns to its original color.

### 1.5.2 How to call menus and functions by the mouse buttons

The buttons can be used to call menus or functions on the display. At the lower right corner of the display the mouse functions area displays available function or menu name, as shown in the figure below. Spin the scrollwheel to choose menu or function desired, then push the left button, scrollwheel or right button as appropriate to access the menu or function desired. Available menus and functions depend on cursor location




Using the functions shown in the figure above as an example, the available functions with the mouse are:
- "Menu" by pushing left button
- "Info" by pushing scrollwheel
- "Chart Menu" by pushing right button

| Radar and Chart Radar modes | | | ECDIS mode | | |
|---|---|---|---|---|---|
| Left button | Scrollwheel | Right button | Left button | Scrollwheel | Right button |
| Menu | Info | Chart Menu*[1] | Menu | Info | Chart Menu |
| Range- | Info | Range+ | Range- | Info | Range+ |
| TM/CU Reset (Note 1) | Info | Ship Offcenter | TM/CU Reset | Info | Ship Offcenter |
| Event | Info | MOB | Event | Info | MOB |
| — | Info | Cursor Menu | — | Info | Cursor Menu |
| Ref Mark | Info | — | Set Chart Center | Info | Activate Scroll |
| Tgt Acquire | Info | Tgt Cancel /L=All | Show Value | Info | Nav Marks |
| — | Info | Nav Marks | Chart Display | Info | Standard Display |
| Chart Display (Note 2) | Info (Note 2) | Primary Display (Note 2) | Symbol Display | Info | — |
| Symbol Display | Info | — | | | |

*[1] No indication in radar mode

**Note 1:** "-" shown when presentation mode is other than North-up or Course-up.
**Note 2**: Not shown in radar mode.

# 1.6 Operation Modes

This chart radar has three modes:

- The **radar mode display** looks like the traditional radar display.
- The **chart radar display** combines radar with chart. (The chart radar mode is optional, and it does not meet the criteria for navigation aid for Japanese flag vessels as defined by Japanese law.)
- The **ECIDS display** shows ECDIS chart.

## 1.6.1 When chart radar mode can be used

There are some limitations when using the system in the "chart radar" mode. Below are the conditions where the "chart radar" mode may be used:

1) **Range in "chart radar" mode is between 0.125 nm and 24 nm**.
   - If you change from "radar" mode to "chart radar" mode when the range is 24 nm or less, the range is not changed. And if range is more than 24 nm the system automatically selects the 24 nm range.
2) **Presentation mode is "course-up RM", "north-up RM" and "north-up TM" in "chart radar" mode.**
   - If you change from "radar" mode to "chart radar" mode when the presentation mode is "head-up RM", the system automatically changes the presentation mode to "north-up TM".

## 1.6.2 How to switch modes

At the top of the screen are the operating mode boxes, Radar, Chart Radar, and in the ECIDS mode, ECDIS. To switch modes put the cursor in the operating mode box then push the left button until desired mode name is displayed in the box.

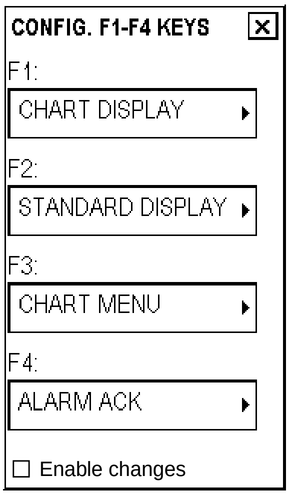
.

## 1.7 How to Configure Hot Keys F1-F4

Hot keys F1-F4 are provided to call a desired function/menu when pushed.

You can select desired function/menu from a predefined list. To select desired function/menu for each key, do the following:

1. Spin the scrollwheel until Menu/Info/Chart Menu appears in the guidance area.
2. Push the left button.
3. Spin the scrollwheel to select Initial Settings then push the scrollwheel.
4. Put the cursor on the triangle in the menu to show the Initial Settings menu.
5. Spin the scrollwheel to select Function keys, then push the scrollwheel. The menu shown right appears.
6. Check Enable changes.
7. Put the cursor on the box for F1, F2, F3 or F4 as appropriate and spin the scrollwheel to select desired function or menu.




| Item | Content |
|---|---|
| **Radar, Radar Chart Mode** | |
| ALARM ACK | Acknowledge alarm generated by this chart radar. |
| CHART MENU | Open chart menu. |
| CHART DISPLAY | Open chart setting dialog box. |
| SENSORS | Open sensor setting dialog box. |
| MENU | Open main menu. |
| STANDARD DISPLAY | Restore standard display. |
| SYMBOL DISPLAY | Show symbol display dialog box. |
| RANGE+ | Shrink chart. |
| RANGE- | Enlarge chart. |
| INITIAL SETTINGS | Show initial settings dialog box. |
| **ECDIS Mode** | |
| ALARM ACK | Acknowledge alarm generated by this chart radar. |
| CHART MENU | Open chart menu. |
| CHART DISPLAY | Open chart setting dialog box. |
| SENSORS | Open sensor setting dialog box. |
| MENU | Open main menu. |
| STANDARD DISPLAY | Restore standard display. |
| SYMBOL DISPLAY | Show symbol display dialog box. |
| TM/CU RESET | Return own ship to screen center in true motion and course-up modes. |
| TOGGLE SHIP CENTER | Toggle own ship position between screen center and cursor location. |
| RANGE+ | Shrink chart. |
| RANGE- | Enlarge chart. |
| INITIAL SETTINGS | Show initial settings dialog box. |

### *How to activate a menu or function with a hot key*

Push the function key corresponding to the menu or function you wish to activate.

# 1.8 Geodetic Datum

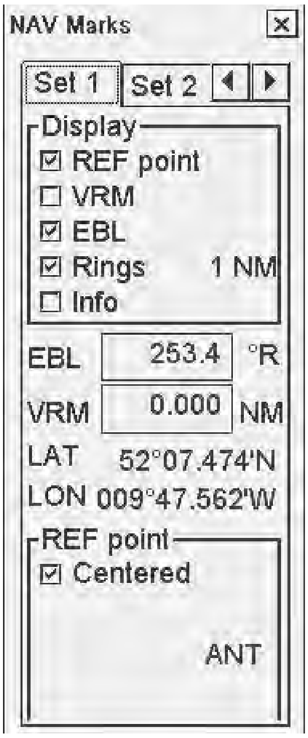
This chart radar uses ENC material, produced to standards using WGS-84 datum. Positioning devices connected to this equipment must work in the WGS-84 datum. IMO require that a chart radar must give an alert if the datum of a positioning device is not the WGS-84. In practice this is impossible, because the standard used by positioning devices (IEC 61162, previously NMEA 0183) does not include a datum message. Consequently, the classification societies only approve a positioning device interfaced with the chart radar where datum cannot be changed (i.e., is always WGS-84).

**Note:** The ability to check datum of position is a relatively new feature for position receivers. It was introduced in standard IEC 61162-1 Ed2, published July 2000. Only an EPFS (for example GPS or DGPS) that has "IEC 61162-1 Ed 2 (2000-7)" indicated in its type approval certificate can support the chart radar to detect datum mismatch.

This system allows the user to change viewed datum. This selection of the datum does not change anything inside the system for navigation calculation processes or for electronic sea chart display processes. But it changes the numerical values of positions displayed on the chart radar display into the user-chosen datum. This is very useful, especially if you like to plot positions from the chart radar on a traditional paper chart.

# 1.9 Navigation Marks on Chart Radar and ECDIS Modes

If the EBL and VRM cannot be controlled from a control unit, use the NAV Marks dialog box. To show this box, spin the scrollwheel to show ---/Info/Nav Marks in the guidance box then push the right button.




### *Set 1 page*

**REF point:** Turn on/off the reference point on the electronic chart.

**VRM:** Turn on/off the VRM (Variable Range Marker), which is displayed around the reference point.

**EBL:** Turn on/off EBL (Electronic Bearing Line), which extends from the reference point.

**Rings:** Turn on/off the range rings, which circumscribe the reference point. The ring interval depends on scale of displayed chart.

**Info:** Turn on/off numerical information about VRM, EBL and reference point. This item is not displayed in the radar or radar chart mode.

**REF point - Centered:** Check to set center for your ship.

### *Set 2 page*

Provides a second set of the items contained in set 1.

### 1.9.1 EBL operation

#### *With control unit RCU-020*

There are two EBLs, No. 1 and No. 2. Each EBL is a straight dashed line extending out from the own ship position up to the edge of the screen. The long dashed line is the No. 1 EBL and the short dashed one is the No. 2 EBL. Push the **EBL ON** key to display either of the EBLs. Successive pushes of the **EBL ON** key toggle the active EBL between No. 1 and No. 2. To adjust an EBL, use the EBL rotary encoder, which is above the **EBL OFF** and **EBL ON** keys. The EBLs can be turned on or off from the NAV Marks dialog box by checking or unchecking EBL on the Set 1 or Set 2 page.

Each EBL carries a range marker, or a short line crossing the EBL at right angles and its distance from the EBL origin is indicated at the VRM readout whether or not the corresponding VRM is displayed. The range marker changes its position along the EBL with the rotation of the VRM rotary encoder. The corresponding VRM must be turned off to use a range marker.

#### *With control unit RCU-015*

You have two methods available to adjust the EBL. You can directly enter a numeric value for the EBL on the NAV Marks dialog box, or you can put the cursor on an EBL, then push and hold down the left button while rotating the trackball. If you locate the cursor over the intersection of a VRM and an EBL, you can adjust them together, using the left button and trackball. (Note that this can also be done from the keyboard-equipped control unit.) The EBLs can be turned on or off from the NAV Marks dialog box by checking or unchecking "EBL" on the Set 1 or Set 2 page.

### 1.9.2 VRM operation

#### *With control unit RCU-020*

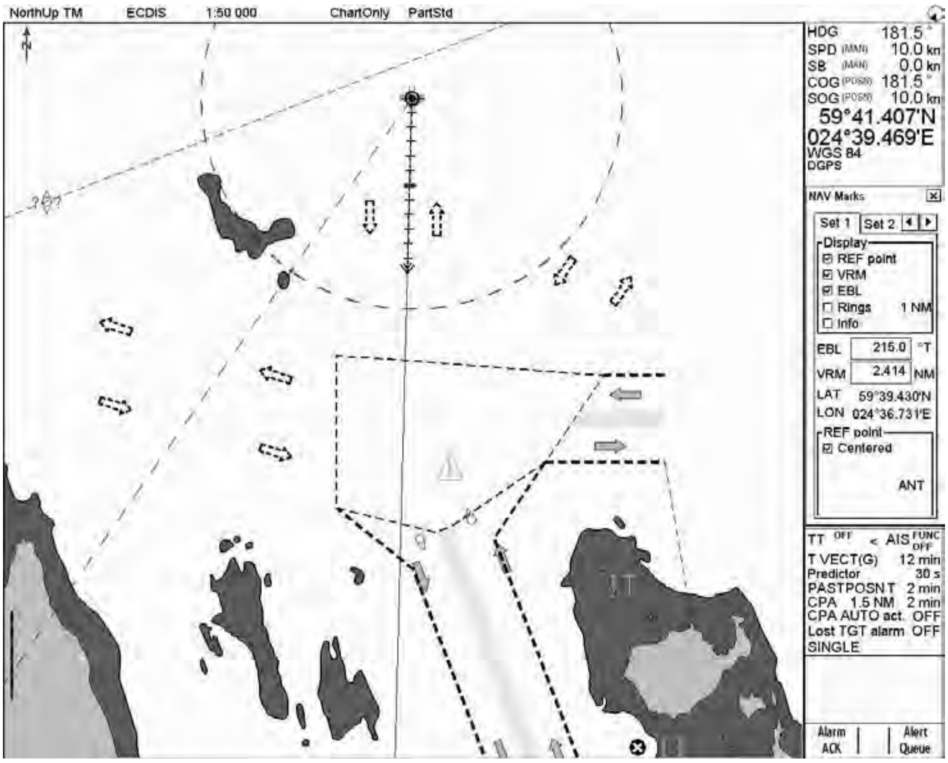
There are two VRMs, No. 1 and No. 2, which appear as dashed rings so that you can discriminate them from the fixed range rings. The two VRMs can be distinguished from each other by different lengths of their dashes. Push the **VRM ON** key to display either of the VRMs. Successive pushes of the **VRM ON** key toggle the active VRM between No. 1 and No. 2. To adjust a VRM, use the VRM rotary encoder, which is above the **VRM OFF** and **VRM ON** keys.

#### *With control unit RCU-015*

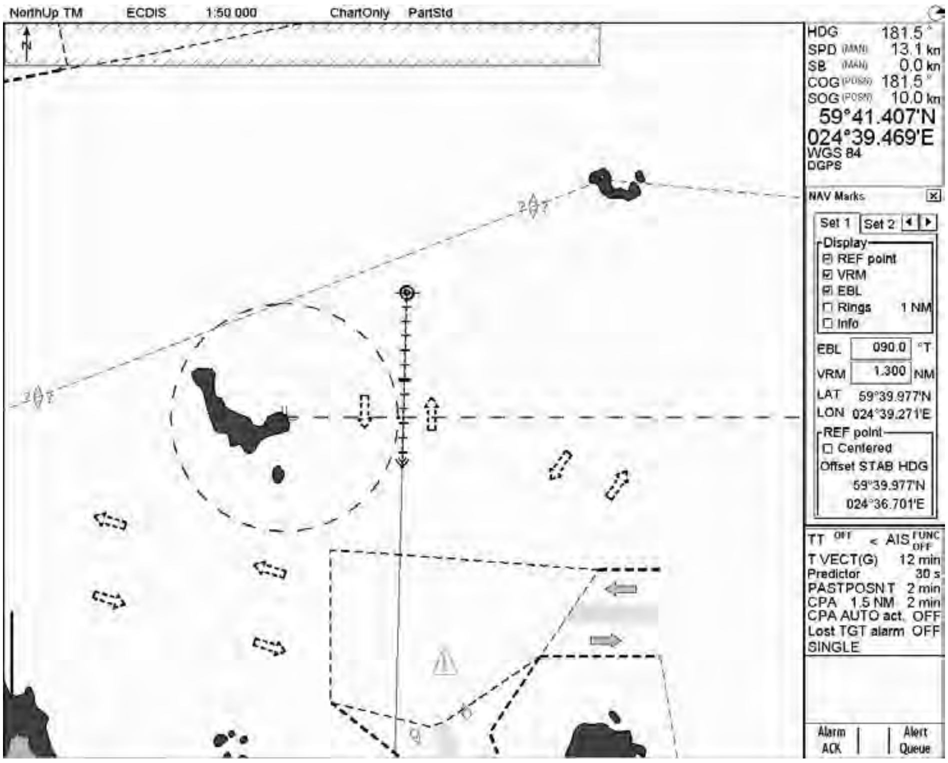
You have two methods available to adjust the VRM. You can directly enter a numeric value for the VRM on the NAV Marks dialog box, or you can put the cursor on the VRM, then push and hold down the left button while rotating the trackball. If you put the cursor over the intersection of a VRM and an EBL, you can adjust them together, using the left button and trackball. (Note that this can also be done from the keyboard-equipped control unit.) The VRMs can be turned on or off from the NAV Marks dialog box by checking or unchecking "VRM" on the Set 1 or Set 2 page.

### 1.9.3 How to shift the reference point of EBL and VRM

The reference point, shown on the display with a cross mark (if turned on in the Nav Marks dialog box), is a user-specified location to which measurements of range and bearing are referred. To choose the location for the reference point, open the Nav Marks dialog box, check REF point, put the cursor at the location desired then push the right button.




*Centered reference point with Variable Range Marker (VRM) and Electronic Bearing Line (EBL)*



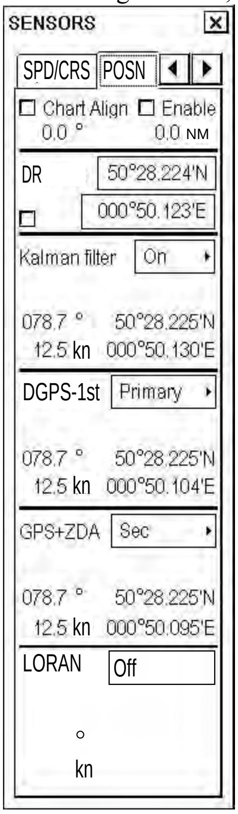

*Reference point off centered with Variable Range Marker (VRM) and Electronic Bearing Line (EBL)*

# 1.10 Ship's Position

The operator can select navigation sensors to use for navigation and view their current values on the SENSORS dialog box. For more information about navigation sensors, see Chapter 15.

**Note:** Availability of sensors to select from the SENSORS dialog box is limited to the position sensors connected to the system.

1. Put the cursor on the Position field in the information area.
2. Push the right button, and the POSN page automatically appears.

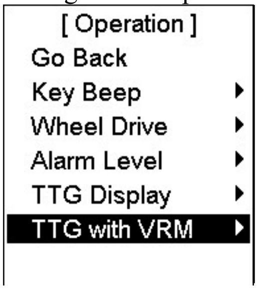



3. Select desired navigation sensors. Spin the scrollwheel to select Position sensors (GPS(s)) either Primary or Secondary then push the scrollwheel.
4. If no Position sensor is selected or no valid position is available, then you can enter position manually, in the "Deadrec" field.
5. Click the Close window button (X) to close the SENSORS dialog box.

## 1.11 How to Customize Operation

Several operation items may be customized to suit your needs.

1. Use the trackball to select the MENU box at the right side of the screen then push the left button.
2. Spin the scrollwheel to select Initial Setting.
3. Push the scrollwheel.
4. Put the cursor on the small triangle in the upper left corner of the Initial Settings dialog box to show the Initial Settings menu. Spin the scrollwheel to select Operation then push the scrollwheel to open the Operation menu.




*Operation menu*

5. Set each item as appropriate, referring to the table below for details.
6. Push the right button to close the menu.

*Operation menu items*

| Item No. | Description | Options |
|---|---|---|
| Key Beep | Loudness of key beep when a key sequence is correctly done. | Off (no beep), Low, Mid, High |
| Wheel Drive | Select how to cycle data when using the scrollwheel. | **Normal:** Cycles numeric data in ascending order and indication data in clockwise order.<br>**Reverse:** Reverse of "Normal". |
| Alarm Level | Volume of audio when alarm is generated by the system. | Off*, Low, Mid, High<br>(*: radar, chart radar only) |
| TTG Display | Select speed to use in TTG calculation: water speed or ground speed. | Off (disable TTG feature), ground speed, water speed |
| TTG with VRM | Show TTG below VRM box, in radar and chart radar modes. | Off, VRM1, VRM2, VRM1+VRM2 |

# 1.12 Alerts Description

When error is detected, the appropriate alert indication appears (in red or yellow) and the audio alert sounds. Silence the audio alert with the **ALARM ACK** key or select the ALARM ACK box then push the left button. The error indication remains on the display until the reason for the alert is removed.

*Alerts description*

| Message no. | Message | Alert category | Description |
|---|---|---|---|
| 100 | RadOv No Headline | Warning | No heading signal |
| 101 | RadOv No Azimuth | Warning | No antenna rotation signal |
| 102 | RadOv No Trigger | Warning | No trigger signal |
| 103 | RadOv No Video | Warning | No video signal |
| 108 | Watch Alarm | Warning | Watch 0:00 (Watch appears and time count freezes at 0:00). |
| 705 | Gyro Error | Warning | Gyro data is not received correctly. |
| 708 | Log Error | Warning | Log data is not received correctly. |
| 709 | Dual-Axis Log (BT) Error | Warning | Dual axis log data is not received correctly. |
| 710 | Echo Sounder Error | Warning | Echo sounder data is not received correctly. |
| 711 | Wind Sensor Error | Warning | Wind sensor data is not received correctly. |
| 712 | Position Eq Error | Warning | Position equipment data is not received correctly. |
| 738 | Datum mismatch | Warning | Position sensor outputs position another datum as set in Installation parameters. |
| 764 | LAN fail for LAN-adapter | Warning | Unexpected LAN error. Maybe LAN cable or HUB broken/disconnected. |
| 771 | LAN fail for Radar | Warning | Unexpected LAN error. Maybe LAN cable broken/disconnected. |
| 860 | Safety Contour | Alarm | Depth is less than the safety contour. |
| 874 | Anchor Watch | Warning | Ship has drifted more than a threshold value. |

Refer to section 4.15 TT Alerts for TT alerts, section 5.17 AIS Alerts for AIS alerts.

### *How to output alarm signals*

Four ports are provided to output alarm signals to external equipment. Select the port and alarm signals to contact output. For more information, see the installation manual.

# 1.13 Charts

S57 ENC ed. 3 vector charts or CM-93 vector charts may be used.

### *How to load and update charts*

Charts can be loaded and updated when the chart radar mode is in use. For more information about how to load and update charts, see Chapter 7 Vector Chart.

# 1.14 Route Monitor

A route created by ECDIS can be overlaid on the radar and chart radar pictures. There are two ways to display the route in this modes:

- Stand-alone mode: Use ECDIS mode-created route
- Route share mode: Use ECDIS route received via an ECDIS unit connected to the network

### Stand-alone mode

1. Use the trackball to select the Route selection box at the upper part of the display.
   Route: Not selected (Route selection box)
2. Spin the scrollwheel to select desired route for monitoring. Route planning must be done in the ECDIS mode.

For more information about route planning and monitoring, see Chapter 10 How to Plan Routes and Chapter 11 How to Monitor Routes.

### Route share mode

Route cannot be created in this mode. Further, route to monitor cannot be selected. ECDIS mode created route is displayed however it cannot be selected for monitoring. On an ECDIS unit connected to the network, open the route from Plan Route. Select Exchange with monitored from the menu, or open the route directly with Monitor route. Then, the route is displayed on the ECDIS screen as well as radar and chart radar.

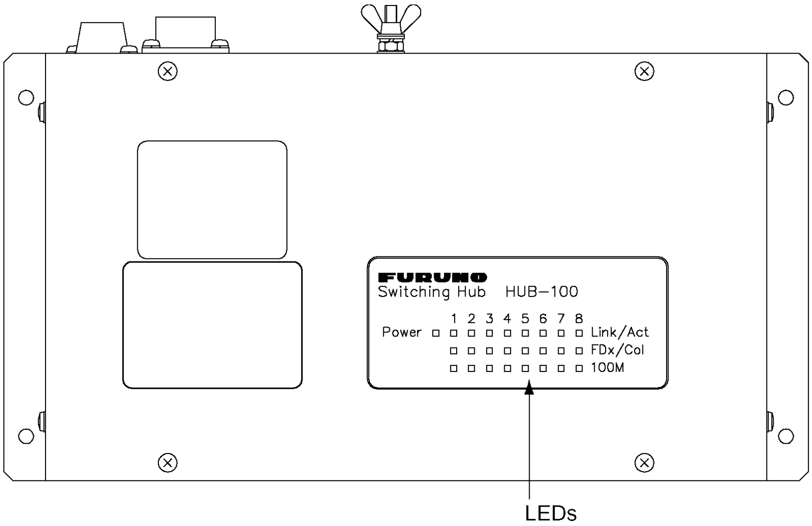
**Note:** To receive route information from an ECDIS unit in the network, that ECDIS must be set up to transfer route information. For further details, contact your dealer.

# 1.15 Switching Hub HUB-100

The HUB-100 provides switching for a radar processor and chart processor unit, using an Ethernet interface (100BASE-TX/10BASE-T). LEDs display link/activity, mode (full-duplex or half-duplex) and collision states. No operation is required of the user. Simply turn on the AC power source for the Switching Hub to power it.

### *LED display*

The LEDs on the top of the unit light, flash or go off according to equipment state. When the equipment is powered all LEDs light and go off.




*Switching Hub HUB-100*

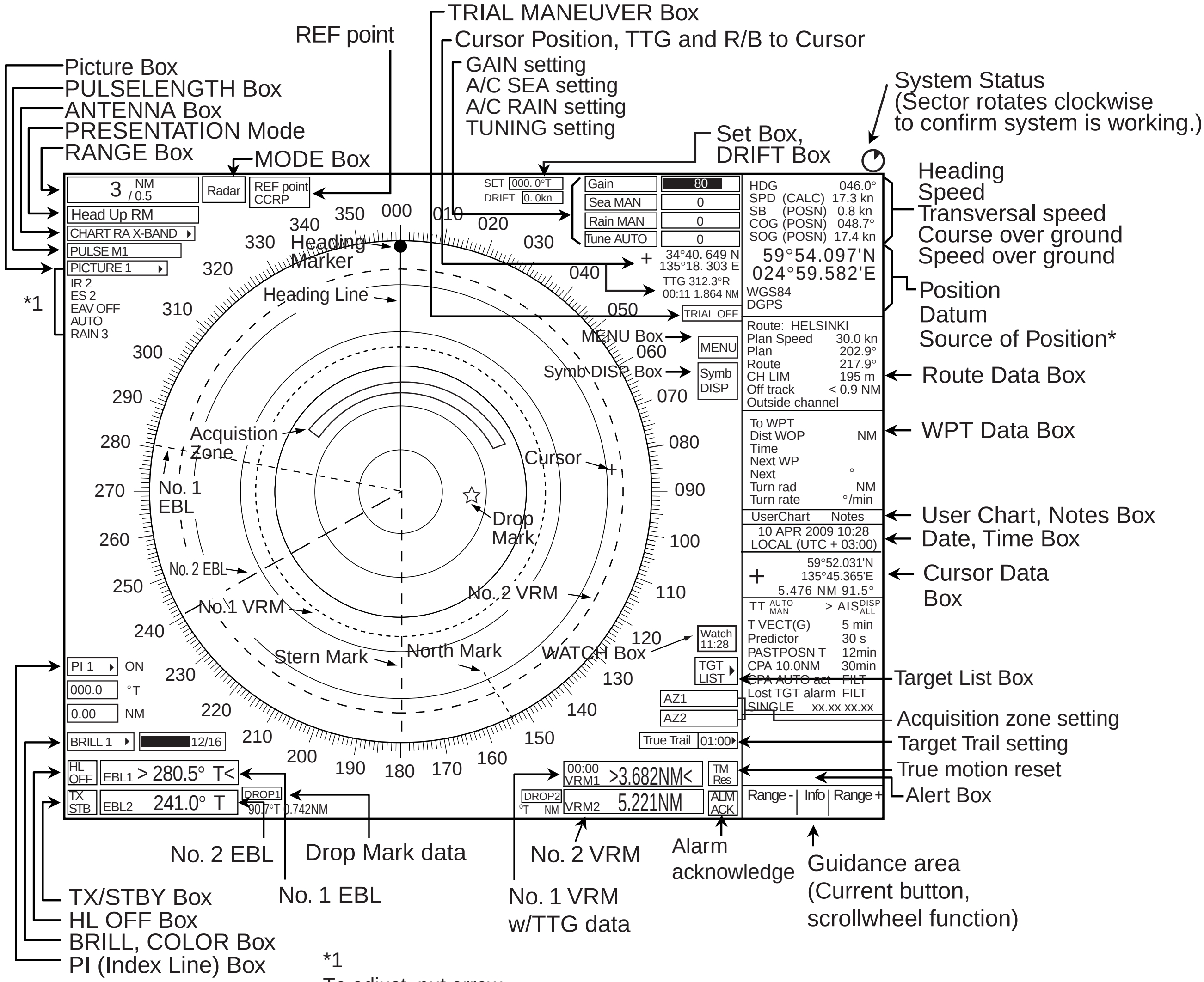
*LED status and meaning*

| LED | Status | Meaning |
|---|---|---|
| Power | Lit<br>Off | Equipment powered<br>Equipment off |
| Link/Act | Lit<br>Off<br>Flashing | Connection with terminal normal<br>Connection with terminal disconnected<br>Data TX or RX |
| FDx/Col | Lit<br>Off<br>Flashing | Full-duplex<br>Half-duplex<br>Collision |
| 100M | Lit<br>Off | 100 Mbps connection<br>10 Mbps connection |

# 2. Radar Operation

## 2.1 Display Indications

### 2.1.1 Radar mode



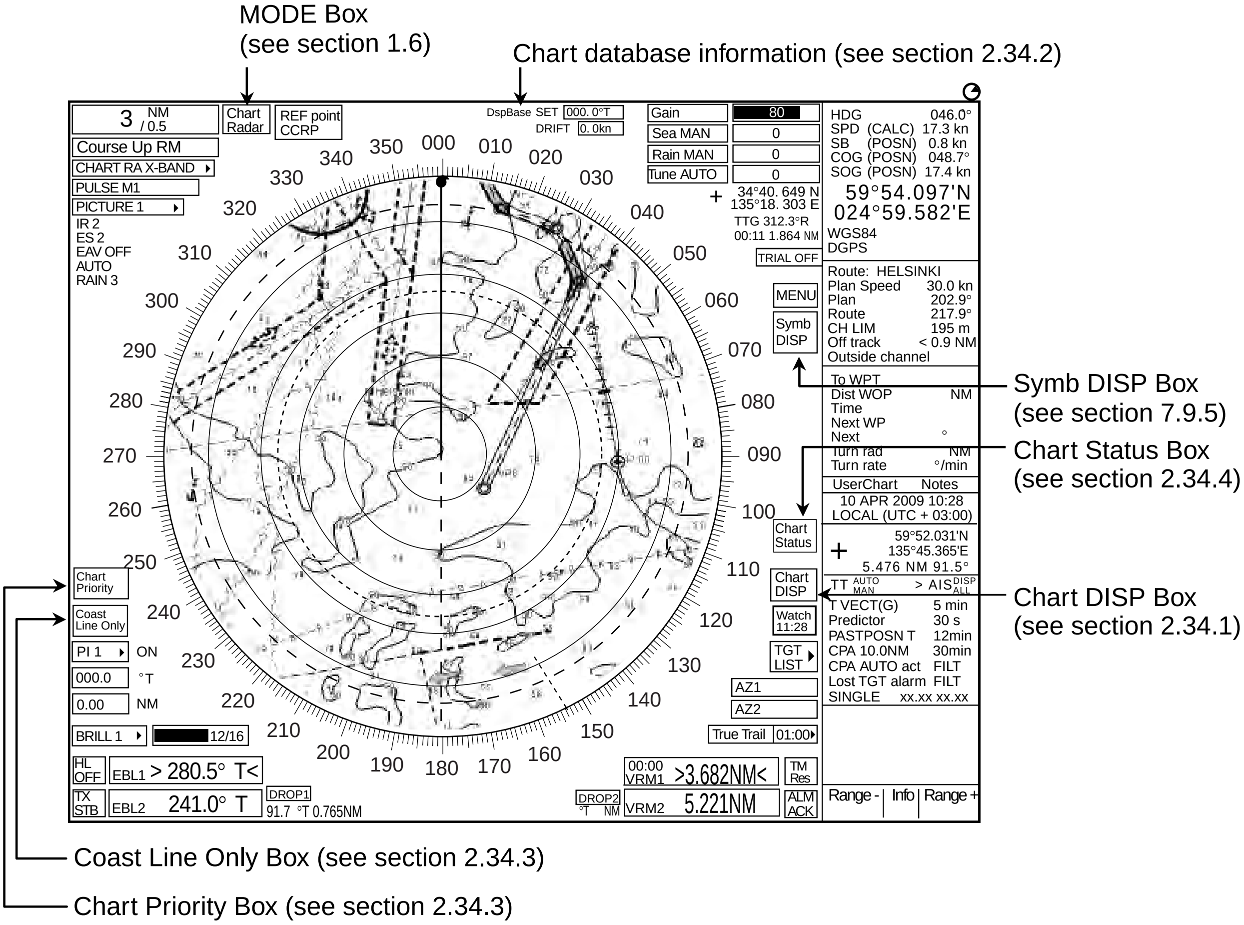

*1
To adjust, put arrow
on setting and left-click.
IR: Interference Rejector
ES: Echo Stretch
EAV: Echo Averaging
AUTO RAIN: Auto rain clutter reduction

***Viewing distance***

The nominal viewing distances for the radar display units are as follows:

- MU-190: 1020 mm
- MU-231: 1200 mm
- MU-201CE: 1080 mm
- MU-231CE: 1200 mm

### 2.1.2 Chart radar mode

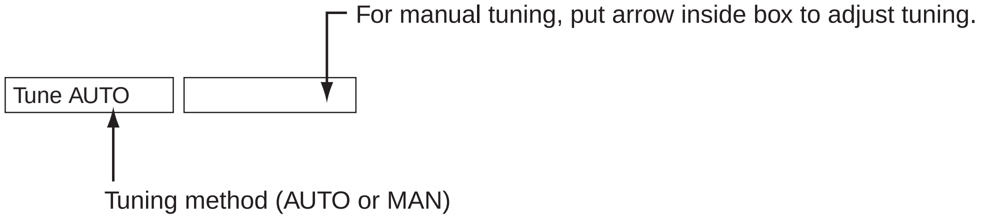


# 2.2 How to Tune the Receiver

## 2.2.1 How to select the tuning method

The tuning method can be selected with the TUNE box at the top of the screen.

1. Use the trackball to select the TUNE box (Tune MAN or Tune AUTO) at the top of the screen.



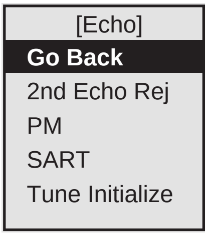

*TUNE box*

2. Push the left button or spin the scrollwheel to display TUNE AUTO or TUNE MAN as appropriate.
3. Push the scrollwheel.

## 2.2.2 How to initialize tuning

Automatic tuning is initialized during the installation. However, if you feel that automatic tuning is not working properly try re-initializing it as follows:

1. Left-click the MENU box.
2. Spin the scrollwheel to select Echo then push the scrollwheel.
3. Spin the scrollwheel to select Tune Initialize.
4. Push the scrollwheel to start initialization.




## 2.2.3 Automatic tuning

Select automatic tuning following section 2.2.1 How to select the tuning method. The TUNE box shows TUNE AUTO.

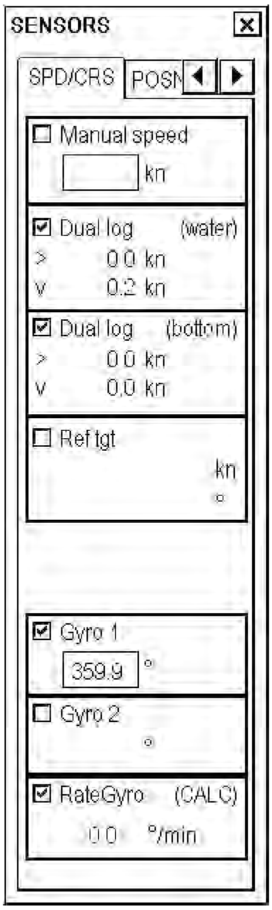
## 2.2.4 Manual tuning

1. Use the trackball to select the RANGE box at top left corner then push the left or right button as appropriate to select the 48-mile range. Push the left button to lower the range; the right button to raise the range.
2. Select manual tuning following the procedure in section 2.2.1 How to select the tuning method.
3. Use the trackball to place the arrow in the tuning bar area in the TUNE box.
4. Spin the scrollwheel to adjust tuning. The best tuning point is where the bar swings maximum. The triangle below the bar graph shows tuning control position; not the tuning condition.

## 2.3 How to Set the Heading

With connection of a gyrocompass, ship's heading is displayed at the right side of the screen. If the GYRO readout looks wrong or the gyro alarm sounds, follow the procedure below to set heading. For more information, see Chapter 1. Note that the FURUNO SC-60/120 does not require adjustment on the radar.

1. Use the trackball to place the arrow in the HDG value at the top right corner of the screen.
2. Push the right button to open the SENSORS dialog box. Use the arrow buttons to select the SPD/CRS dialog box.




*SENSORS dialog box, SPD/CRS page selected*

3. Roll the trackball downward to select Gyro 1or Rate gyro as applicable then push the scrollwheel to place check mark in box.
   Initial setting of gyro1 is not necessary if it outputs serial data. However, if it is of synchro or stepper type, you will need to set initial gyro value. For how to adjust the gyro value, see the installation manual.
4. Click the Close window button (X) to close the SENSORS dialog box.

# 2.4 Presentation Modes

## 2.4.1 Presentation modes

This radar has the following presentation modes in the radar mode:

**Relative Motion (RM)**

**Head-up**: Unstabilized

**Head-up TB:** Head-up with compass-stabilized bearing scale (True Bearing) where the bearing scale rotates with the compass reading.

**Course-up:** Compass-stabilized relative to ship’s orientation at the time of selecting course-up.

**North-up:** Compass-stabilized with reference to North.

**True Motion (TM)**

**North-up:** Ground or sea stabilized with compass and speed inputs.

### *Choosing presentation mode by keyboard*

Push the **MODE** key consecutively to select radar presentation mode desired. The PRESENTATION MODE box shows the current presentation mode.

### *Choosing presentation mode by trackball*

1. Use the trackball to select the PRESENTATION MODE box at the top left corner of the screen.
2. Push the left button to select mode desired.

**Loss of gyrocompass signal**
When the compass signal is lost, alert **"705: Gyro error"** or "**706: Gyro error**" appears. After timeout, the alert "**402: No heading available**" appears, the presentation mode automatically becomes head-up, and all TT and AIS targets are erased. Check the gyro and select the presentation mode with the **MODE** key or the PRESENTATION MODE box.

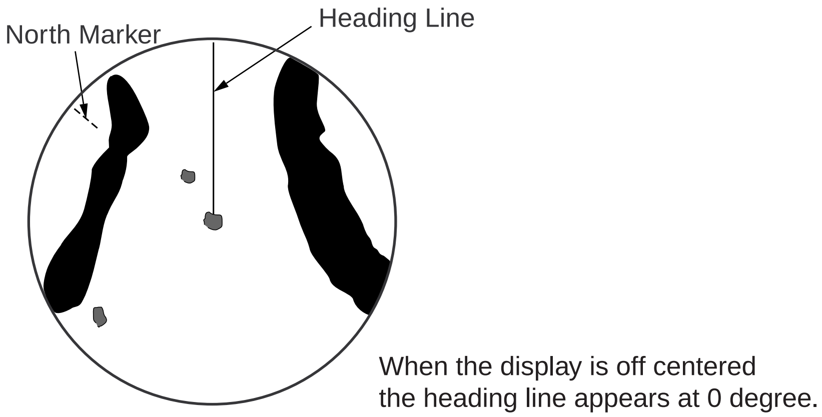
## 2.4.2 Description of presentation modes

### *Head-up mode*

The head-up mode is a display in which the line connecting own ship and the top of the display indicates own ship’s heading.

The target pips are painted at their measured distances and in their directions relative to own ship’s heading.

The short line on the bearing scale is the north marker, which indicates heading sensor north. A failure of the heading sensor input will cause the heading readout to disappear, and the message "No heading available" or "Gyro error" (message in red) appears at the lower right corner of the screen.

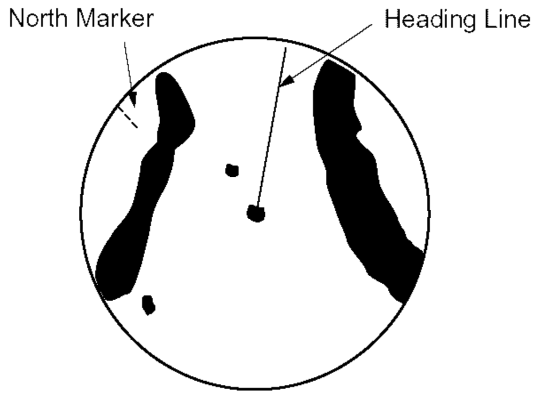



*Head-up mode*

### Course-up mode

The course-up mode is an azimuth stabilized display in which a line connecting the center with the top of the display indicates own ship's intended course (namely, own ship's previous heading just before this mode has been selected).

Target pips are painted at their measured distances and in their directions relative to the intended course, which is maintained at the 0-degree position. The heading line moves in accordance with ship's yawing and course change. This mode is useful for avoiding smearing of picture during course change.




*Course-up mode*

### Head-up TB (True Bearing) mode

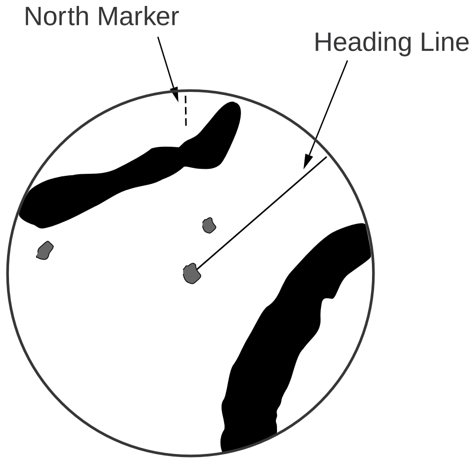
Radar echoes are shown in the same way as in the head-up mode. The difference from normal head-up presentation lies in the orientation of the bearing scale. The bearing scale is heading sensor stabilized. That is, it rotates in accordance with the heading sensor signal, enabling you to know own ship's heading at a glance.

This mode is available when the radar is interfaced with a gyro heading sensor. If the gyro heading sensor fails, the bearing scale returns to the state of head-up mode.

### North-up mode

The north-up mode paints target pips at their measured distances and in their true (heading sensor) directions from own ship, north bearing maintained at the top of the screen. The heading line changes its direction according to the ship's heading. Requires heading signal.

If the compass fails, the presentation mode changes to head-up and the north marker disappears. A failure of the heading sensor input will cause the heading readout to disappear, and the message "No heading available" or "Gyro error" (message in red) appears at the lower right corner of the screen.

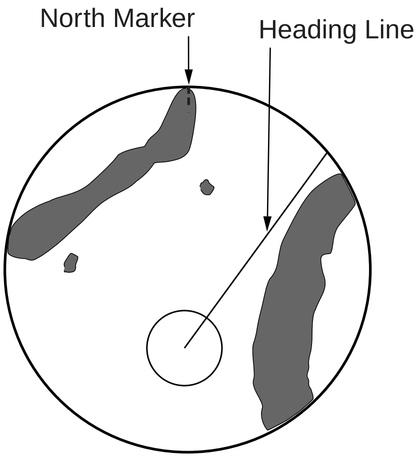



*North-up mode*

### *True motion mode*

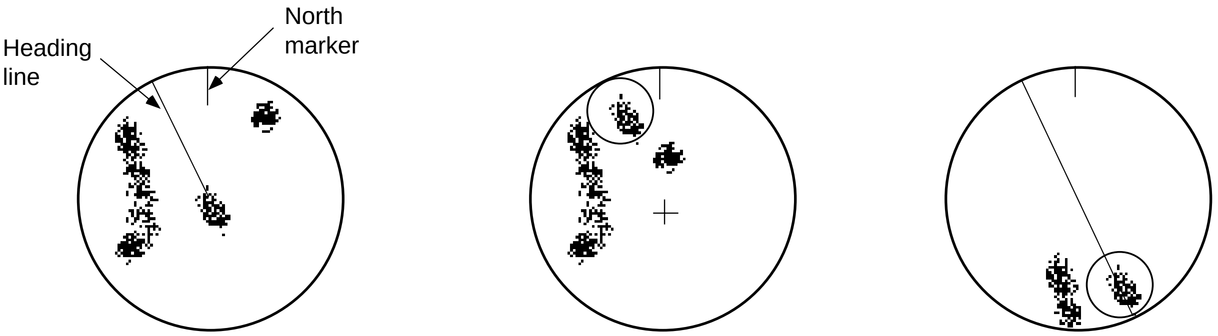
Own ship and other moving objects move in accordance with their true courses and speed. In ground stabilized TM, all fixed targets, such as landmasses, appear as stationary echoes. In the sea stabilized TM without set and drift inputs, the landmass can move on the screen. Note that true motion is not available on the 96 nm range scale. If COG and SOG (both over the ground) are not available on TM mode, enter the set (tide direction) and drift (tide speed) manually referring to the Tide Table.

If the position of the CCRP results in a part of the bearing scale not being distinguishable, that part of the bearing scale is indicated with appropriate reduced detail.




A failure of the heading sensor input will cause the heading readout to disappear, and the message "No heading available" or "Gyro error" (message in red) appears at the lower right corner of the screen.

When own ship reaches a point corresponding to 75% of the radius of the display, own ship position is automatically reset to a point of 75% radius opposite to the extension of the heading line passing through the display center. You can also reset the own ship symbol manually by pushing the **CU/TM RESET** key, or use the trackball to select the TM Res box at the bottom right corner of the display then push the left button.




(a) True motion is selected
(b) Own ship has reached a point 75% of display radius
(c) Own ship is automatically reset to 75% of radius

# 2.5 How to Input Your Ship's Speed

The Target Tracking (TT) and azimuth stabilized presentation modes require own ship speed input and compass signal. The speed can be entered from a log (STW) or GPS (SOG), or manually from the menu. Note that FURUNO GPS Navigator GP-90 provides COG and SOG.

For more information about positioning and Kalman filter operation, see Chapter 15 Navigation Sensors.

## 2.5.1 Speed selection for SPD and SB (TT, AIS and trails)

The system speed that is used for TT, AIS and trails appears at the upper right corner in fields "SPD" and "SB." These values are used for:

- Calculation of target CPA/TCPA

- Target past position

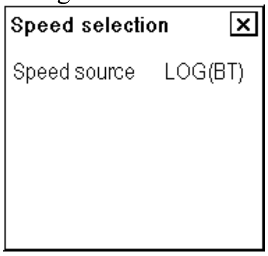
- Target trail

**Note 1:** SPD: Longitudinal speed, SB: Transversal speed, positive value to starboard

**Note 2:** When the AIS feature is active, MANUAL and REF are not available for selection.

To select system speed "SPD" and "SB", do the following:

1. Put the cursor on the SPD or SB field in the information area then push the left button to show the following dialog box.




2. Put cursor on Speed source (LOG(BT) in this case) and use scrollwheel to select appropriate source.

## 2.5.2 Speed selection for COG and SOG (navigation)

The system speed that is in use for navigation appears at "COG" and "SOG." These values are used for:

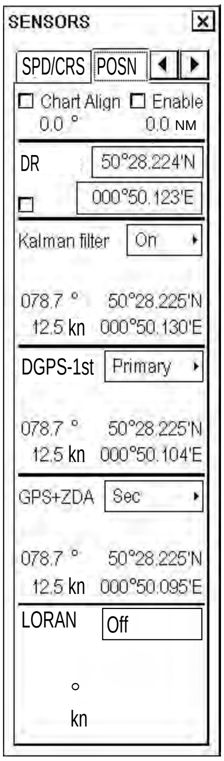
- TTG calculation
- Route Monitoring for ETA calculation
- Kalman filter for position calculation
- Dead reckoning for position calculation

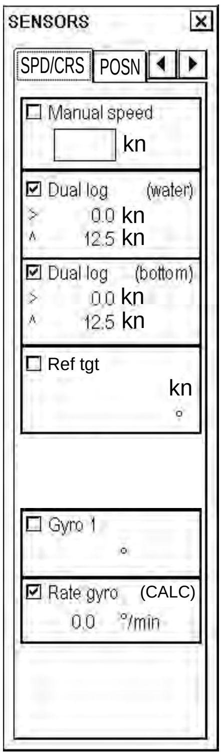
**Note 1:** Availability of sensors for selection from the SENSORS dialog box depends on the devices interfaced with this system.

**Note 2:** When the AIS feature is active, MANUAL and REF are not available for selection.

The operator can select the navigation sensors to use for navigation and view their current values on the SENSORS dialog box. For more information about source of speed used by system, see Chapter 15

1. Put the cursor on the COG or SOG field in the information area then push the right button.




2. Select desired navigation sensors. Use the trackball to select Position sensors (GPS(s) either Primary or Secondary then push the scrollwheel.
3. Open the SPD/CRS page, select the appropriate log then push the left button. Select among LOG or Dual log (water): Log, speed thru water (STW) Dual log (bottom), speed over ground (SOG). Note that a log cannot produce BT (Bottom Tracking) speed in deep waters without set and drift entry.
4. Click the Close window button (X) to close the SENSORS dialog box.

### *Notes on speed input*

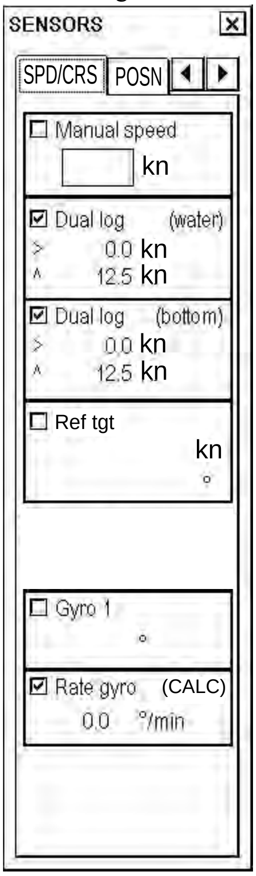
- IMO Resolution A.823(19) for TT recommends that a speed log to be interfaced with a TT should be capable of providing through-the-water speed (forward speed).
- A single-axis water log cannot measure speed when the wind is coming from the leeway direction.

### 2.5.3 Manual speed input

If no automatic speed input is selected or working, enter speed manually as below. In this case the speed data type is shown as (man).

Manual speed can be set on the SPD/CRS page of SENSORS dialog box.

1. Put the cursor on the Position field in the information area.
2. Push the right button to open the SPD/CRS page.




3. Use the trackball to select Manual speed, and spin the scrollwheel to enter desired speed.
4. Click the Close window button (X) to close the SENSORS dialog box.

**Note:** The maximum manual speed value that can be entered is set with MAX Speed in the Ship parameters window in the Ship and Route Parameters dialog box. For details, see section 19.1.3 Navigation parameters setting.

## 2.6 How to Select the Range Scale

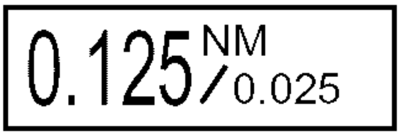
The selected range scale, range ring interval and pulse length are shown at the upper left corner on the screen. When a target of interest comes closer, reduce the range scale so that it appears in 50-90% of the display radius.

### *From the control unit w/keyboard*

Use the **RANGE** key to select range desired. Hit the "+" part of the key to raise the range; the "-" part to lower the range.

### *By trackball*

1. Use the trackball to select the RANGE box at the top left corner of the screen. The guidance area shows "RANGE - / OK / RANGE +".




2. Push the left button to lower the range; the right button to raise the range. You can also select the range by spinning the scrollwheel then pushing it.

## 2.7 How to Adjust the Sensitivity

The gain control adjusts the sensitivity of the receiver. The proper setting is such that the background noise is just visible on the screen. If you set up for too little sensitivity, weak echoes may be missed. On the other hand excessive sensitivity yields too much background noise; strong targets may be missed because of the poor contrast between desired echoes and the background noise on the display.

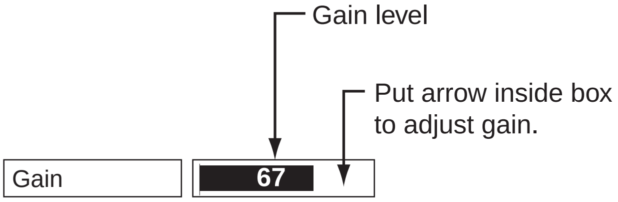
Adjust the gain so background noise is just visible on the screen.

### *From the control unit w/keyboard*

While monitoring the radar image, operate the **GAIN** control to adjust the sensitivity.

### *By trackball*

1. Use the trackball to place the arrow on the gain level indicator at the top of the screen.




2. Spin the scrollwheel downward to increase the gain or upward to decrease it. 100 levels (0-100) are available.

## 2.8 How to Suppress Sea Clutter

Echoes from waves cover the central part of the display with random signals known as sea clutter. The higher the waves, and the higher the antenna above the water, the further the clutter will extend. When sea clutter masks the picture, suppress it with the A/C SEA control, either manually or automatically.

When both sea clutter and rain clutter are reduced, the sensitivity is decreased more than when only one is adjusted. For that reason adjust them carefully.

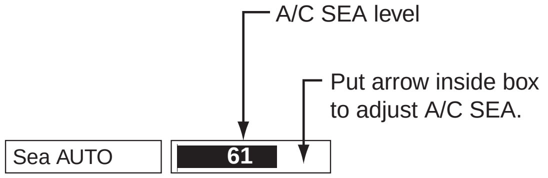
The echo average is useful for reducing reflections from the sea surface. However, high-speed targets are harder to detect than stationary ones when the echo average is active.

### 2.8.1 Automatic adjustment by the A/C SEA control

Auto A/C SEA allows for fine-tuning of the A/C SEA circuit, within ±20 dB. Accordingly, with the bar reading set to 100, gain is not lowered to minimum as with manual A/C SEA on close-in ranges. Further, the auto A/C SEA level is low because the average value of the original input echo is low in areas where there are no sea surface reflections. For example, when the ship is alongside a quay and the radar picture shows echoes from both land and sea, you can observe the size of echoes because the STC curve is different depending size of echoes.

**Note:** The auto A/C function can erase weak target echoes. Adjust the control carefully, watching the display.

1. Use the trackball to select SEA MAN (whichever is shown) at the top of the display.
2. Push the left button to display Sea AUTO.




#### *From the control unit w/keyboard*

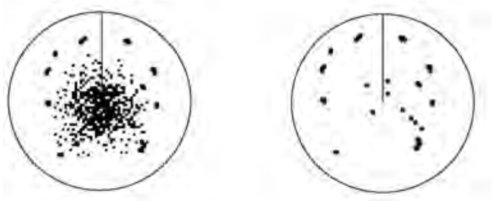
While observing the radar image, adjust the sea clutter with the **A/C SEA** control. 100 levels are available.

#### *By trackball*

1. Use the trackball to place the arrow in the A/C SEA level indicator at the top of the display.
2. While observing the radar image, spin the scrollwheel downward to increase the A/C SEA or upward to decrease it. 100 levels (0-100) are available.

### 2.8.2 Manual adjustment of A/C SEA

The A/C SEA control reduces the amplification of echoes at short ranges (where clutter is the greatest) and progressively increases amplification as the range increases, so amplification will be normal at those ranges where there is no sea clutter.



Sea clutter at screen center    A/C SEA adjusted; sea clutter suppressed

The proper setting of the A/C SEA should be such that the clutter is broken up into small dots, and small targets become distinguishable. If the setting is set too low, targets will be hidden in the clutter, while if the setting is too high, both sea clutter and targets will disappear from the display. In most cases adjust the control until clutter has disappeared to leeward, but a little is still visible windward.

Be careful not to remove all sea clutter, because you may erase weak echoes. Further, the possibility of losing weak echoes is greater when you use both A/C SEA and A/C RAIN to reduce clutter.

#### *From the control unit w/keyboard*

1. Use the trackball to place the arrow in the Sea AUTO box.
2. Push the left button to show Sea MAN.
3. Watching the radar image, adjust the A/C SEA with the **A/C SEA** control. 100 levels (0-100) are available.

#### *By trackball*

1. Use the trackball to place the arrow in the Sea AUTO box.
2. Push the left button to show Sea MAN.
3. Put the cursor on the A/C SEA level indicator.
4. While observing the radar image, spin the scrollwheel downward to increase the A/C SEA or upward to decrease it. 100 levels (0-100) are available.

## 2.9 How to Suppress Rain Clutter

Use the AUTO RAIN and A/C RAIN to suppress rain clutter. AUTO RAIN suppresses rain clutter in the picture and A/C RAIN suppresses clutter picked up by the antenna.

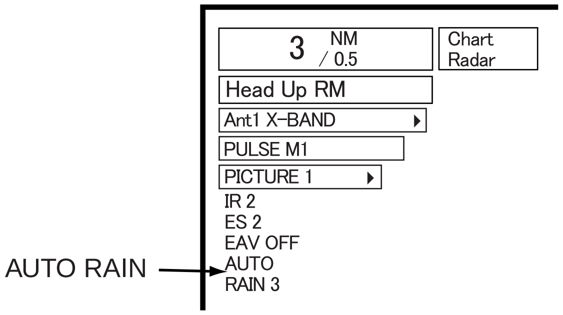
When both sea clutter and rain clutter are reduced the sensitivity is decreased more than when only one is adjusted. For that reason adjust them carefully.

The echo average is useful for reducing reflections from the sea surface. However, high-speed targets are harder to detect than stationary ones when the echo average is active.

Be careful not to remove all rain clutter, because you can erase weak echoes. Further, the possibility of losing weak echoes is greater when you use both A/C RAIN and A/C SEA to reduce clutter.

### 2.9.1 How to turn AUTO RAIN on or off

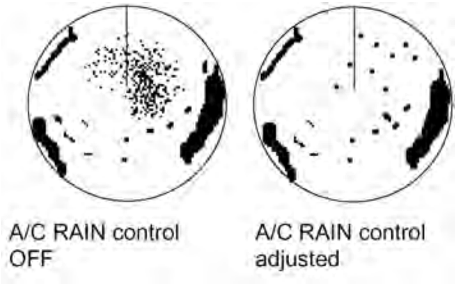
1. Use the trackball to select the AUTO RAIN indication at the left side of the screen.
2. Push the left button to select the auto rain level desired. The indication changes in the sequence of OFF, 1, 2, 3 and 4. The higher the value the greater the suppression.




### 2.9.2 How to adjust A/C RAIN

The vertical beam width of the antenna is designed to see surface targets even when the ship is rolling. However, by this design the unit will also detect rain clutter (rain, snow, or hail) in the same manner as normal targets.

The **A/C RAIN** control adjusts the receiver sensitivity as the **A/C SEA** control does but rather in a longer time period (longer range). The higher the setting the greater the anti-clutter effect. When echoes from precipitation mask solid targets, adjust the A/C RAIN control to split up these unwanted echoes into a speckled pattern, making recognition of solid targets easier.

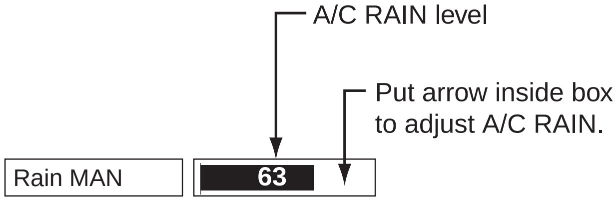



#### *From the control unit w/keyboard*

Adjust the A/C RAIN with the **A/C RAIN** control.

#### *By trackball*

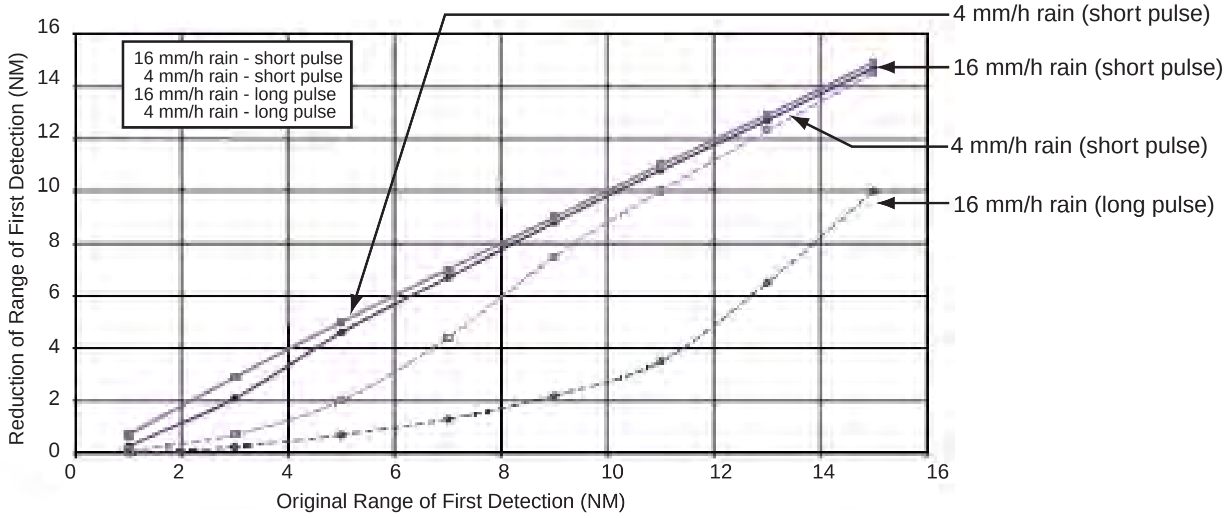
1. Use the trackball to put the cursor on the A/C RAIN level indicator at the top right side of the display.



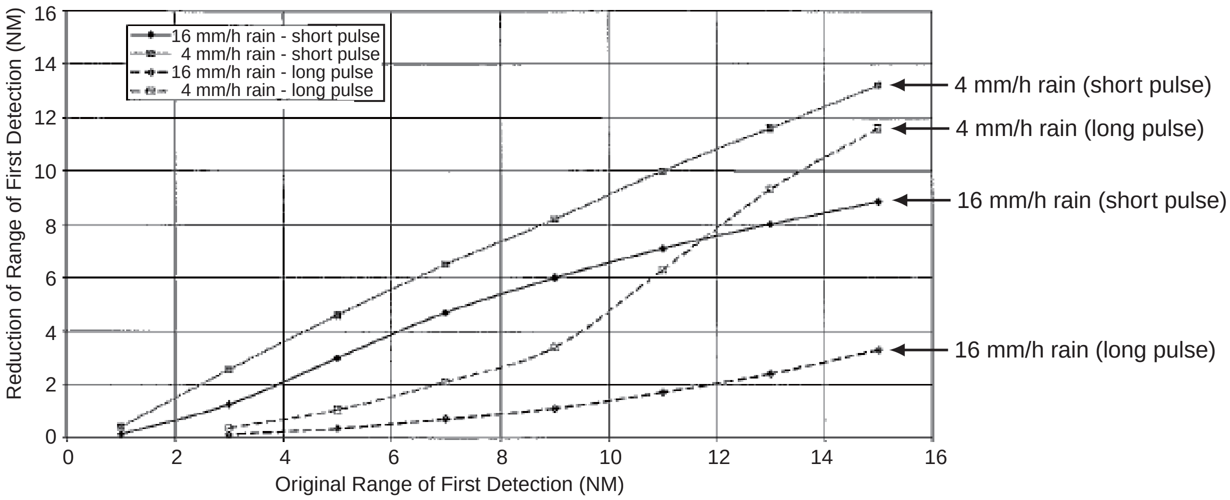

*A/C RAIN level indicator*

2. While observing the radar image, spin the scrollwheel downward to increase the A/C RAIN effect or upward to decrease it. 100 levels (0-100) are available.

**Note:** The detection range is reduced when the A/C RAIN is used to show targets in rain. Generally, the amount of rain, TX pulse length and TX frequency are factors in determining how the detection range is affected. The figures shown below illustrate this occurrence.




*Reduction of rain to first detection due to rain at S-band*




*Reduction of rain to first detection due to rain at X-band*

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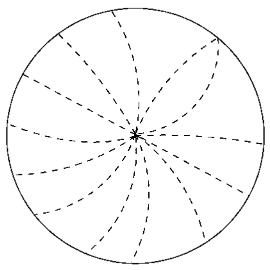
*IEC 62388 ed.1.0    Copyright © 2007 IEC Geneva, Switzerland.www.iec.ch*

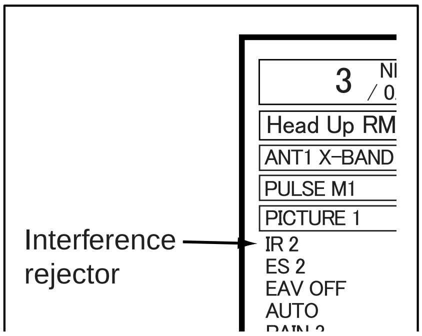
## 2.10 Interference Rejector



Mutual radar interference may occur in the vicinity of another shipborne radar operating in the same frequency band as own radar. It is seen on the screen as a number of bright spikes either in irregular patterns or in the form of usually curved spoke-like dotted lines extending from the center to the edge of the picture. Activating the interference rejector circuit can reduce this type of interference.

The interference rejector is a kind of signal correlation circuit. It compares the received signals over successive transmissions and suppresses randomly occurring signals. There are three levels of interference rejection depending on the number of transmissions that are correlated.

1. Use the trackball to select the IR indication at the left side of the screen.
2. Push the left button to select the interference rejection level desired. The indication changes in the sequence of OFF, 1, 2, and 3. The higher the value the greater the rejection.



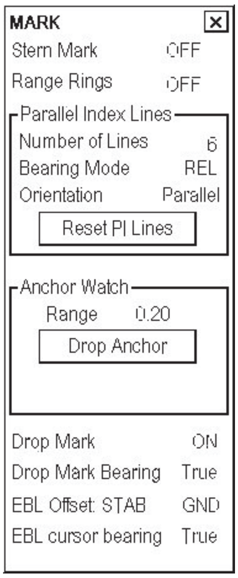

## 2.11 How to Measure the Range to a Target

The range to a target may be measured three ways: with the fixed range rings, with the cursor, or with the VRM.

Use the fixed range rings to obtain a rough estimate of the range to a target. They are the concentric solid circles about own ship, or the sweep origin. The number of rings is automatically determined by the selected range scale and their interval is displayed at the upper-left position of the screen. Count the number of rings between the center of the display and the target. Check the range ring interval and judge the distance of the echo from the inner edge of the nearest ring.

### 2.11.1 How to turn range rings on/off

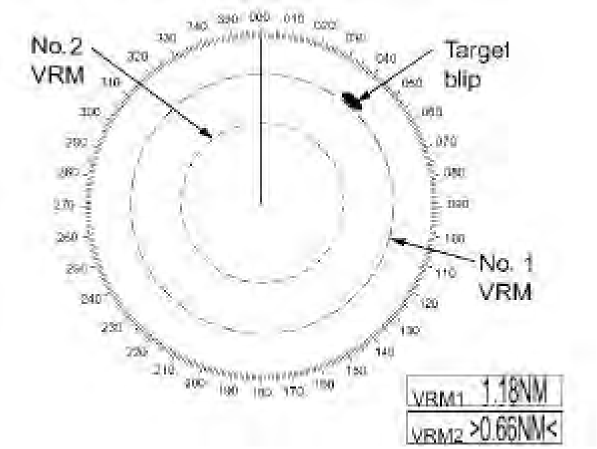
1. Use the trackball to select the MENU box at the right side of the screen.
2. Push the left button to display the Main menu.
3. Spin the scrollwheel to select Mark then push the scrollwheel.




4. Use the trackball to place the arrow on the setting of Range Rings.
5. Spin the scrollwheel to select OFF or ON as appropriate then push the scrollwheel.
6. Click the Close window button (X) to close the Mark menu.

## 2.11.2 How to measure range by the variable range marker (VRM)

There are two VRMs, No. 1 and No. 2. They are dashed rings so that you can discriminate them from the fixed range rings. The two VRMs can be distinguished from each other by different lengths of dashes.




*Measuring range with VRMs*

### *From the control unit w/keyboard*

1. Push the **VRM ON** key to display either of the VRMs. Successively pushing the **VRM ON** key toggles the active VRM between No. 1 and No. 2. The currently active marker is enclosed with >.....<.
2. Operate the VRM rotary control to align the active variable range marker with the inner edge of the target of interest and read its distance at the lower-right corner of the screen. Each VRM remains at the same geographical distance when you operate the **RANGE** key or the RANGE box. This means that the apparent radius of the VRM ring changes in proportion to the selected range scale.
3. Push the **VRM OFF** key to erase each VRM.

### *By trackball*

1. Use the trackball to place the arrow in the VRM1 or VRM2 box, whichever VRM you want to use.

   VRM1

   VRM2

   *VRM boxes*
2. The guidance area reads "VRM on/." Push the left button to turn on the VRM. The guidance area now reads "/L = DELETE /."
3. Put the cursor on the VRM1 or VRM2 box, and spin the scrollwheel to align the marker with the inner edge of the target. Each VRM remains at the same geographical distance when you operate the **RANGE** key. This means that the apparent radius of the VRM ring changes in proportion to the selected range scale.
4. To erase a VRM, select the appropriate VRM box then push the left button until the VRM disappears from the screen.

### *How to show the TTG-to-VRM indication*

You can show the TTG to VRM location(s) as follows:

1. Open the main menu followed by the Initial Settings menu.
2. Put the cursor on the triangle in the menu to show the Operation menu.
3. Select TTG with VRM.
4. Spin the scrollwheel to select one of the following:
   OFF: NO VRM TTG display
   VRM1: Show TTG data on VRM1 indication
   VRM2: Show TTG data on VRM2 indication
   VRM1+VRM2: Show TTG data on both VRM1 and VRM2 indications.

TTG-to-VRM indication → 00:00 VRM1 >3.682NM<

## 2.12 How to Measure the Bearing to a Target

Use the Electronic Bearing Lines (EBLs) to take bearings of targets. There are two EBLs, No. 1 and No. 2. Each EBL is a straight dashed line extending out from the own ship position up to the circumference of the radar picture. The coarse dashed line is the No. 1 EBL and the fine dashed one is the No. 2 EBL.

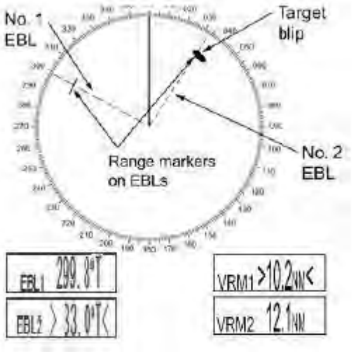
### 2.12.1 How to measure the bearing

#### *From the control unit w/keyboard*

1. Push the **EBL ON** key to display either of the EBLs. Successive presses of the **EBL ON** key toggle the active EBL between No. 1 and No. 2. The currently active marker is enclosed with >.....<.
2. Operate the EBL rotary control clockwise or counterclockwise until the active EBL bisects the target of interest, and read its bearing at the lower-left corner of the screen.

   **Note:** Each EBL carries a range marker, or a short line crossing the EBL at right angles and its distance from the EBL origin is indicated at the VRM readout whether or not the corresponding VRM is displayed. The range marker changes its position along the EBL with the rotation of the VRM control.
3. Push the **EBL OFF** key to erase each EBL.

#### *By trackball*




1. Use the trackball to place the arrow in the EBL1 or EBL2 box, whichever EBL you want to use.

   EBL1

   EBL2

   *EBL boxes*
2. Spin the scrollwheel to bisect the target with the EBL.

   **Note:** Each EBL carries a range marker, or a short line crossing the EBL at right angles and its distance from the EBL origin is indicated at the VRM readout whether or not the corresponding VRM is displayed. The range marker changes its position along the EBL with the rotation of the VRM.
3. To erase an EBL, select the appropriate EBL box then push the left button until the EBL disappears from the screen.

### 2.12.2 How to select true or relative bearing

The EBL readout is affixed by "R" (relative) if it is relative to own ship's heading, "T" (true) if it is referenced to the north.

To select bearing reference in the head-up mode, do the following:

1. Use the trackball to select the Menu box at the right side of the screen.
2. Push the left button to display the Main menu.
3. Spin the scrollwheel to select Mark then push the scrollwheel.
4. Use the trackball to put the arrow on the setting of the EBL cursor bearing.
5. Spin the scrollwheel to select True or REL then push the scrollwheel.
6. Click the Close window button (X) to close the Mark menu.

**Note:** When the gyrocompass heading changes, the EBL and its indication change as follows:
Head-up, relative: EBL indication and EBL remain unchanged.
Head-up, true: EBL indication remains the same; EBL moves.
Course-up, true: EBL indication and EBL remain unchanged.
Course-up, relative: EBL indication remains the same, EBL moves.
North-up, relative: EBL indication remains the same, EBL moves.
North-up, true: EBL indication and EBL remain unchanged.

# 2.13 Pulse Length

The pulse length in use is displayed at the upper-left position of the screen using the indications shown in the table below.

*Label and pulse length*

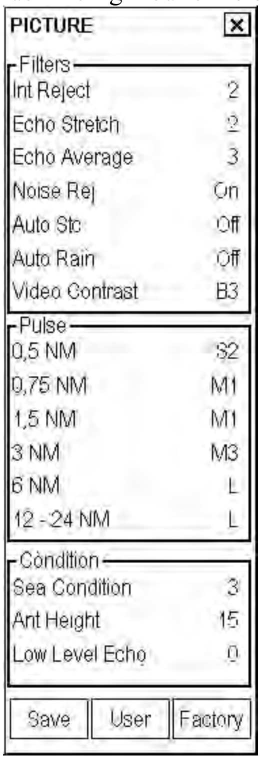
| Indication | Pulse length (µs) |
|---|---|
| S1 (Short pulse 1) | 0.07 |
| S2 (Short pulse 2) | 0.15 |
| M1 (Medium pulse 1) | 0.3 |
| M2 (Medium pulse 2) | 0.5 |
| M3 (Medium pulse 3) | 0.7 |
| L (Long pulse) | 1.2 |

Appropriate pulse lengths are preset to individual range scales and function keys. If you are not satisfied with the current pulse length settings, you can change them as shown below.

## 2.13.1 How to select pulse length

You can select the pulse length for the 0.5 to 24 nm range scales as below.

1. Use the trackball to select the PICTURE box at the left side of the screen.
2. Push the right button to show the PICTURE menu.




3. From the Pulse window, select the option of the range for which you want to adjust pulse length. Spin the scrollwheel to choose setting then push the scrollwheel.
4. Click the Close window button (X) to finish.

## 2.13.2 How to change pulse length

1. Use the trackball to select the PULSE box at the left side of the screen.

   PULSE XX

   XX=Pulse length setting

2. Push the left button to shorten the pulse length or the right button to widen the pulse length. You can also select the pulse length by spinning it pushing it to confirm selection.

# 2.14 Collision Assessment by Offset EBL

The origin of the EBL can be placed anywhere with the trackball to enable measurement of range and bearing between any targets. This function is also useful for assessment of the potential risk of collision. It is possible to read CPA (Closest Point of Approach) by using a VRM as shown below in Figure (a). If the EBL passes through the sweep origin (own ship) as illustrated in Figure (b), the target ship is on a collision course.

## 2.14.1 How to assess risk of collision by the offset EBL

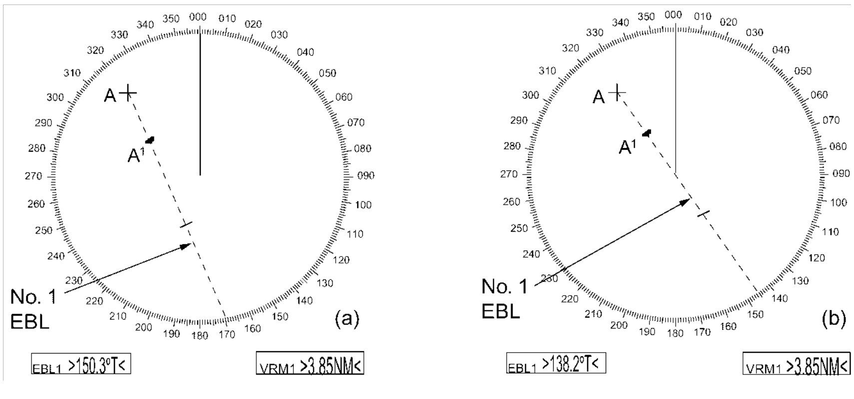
### *From the control unit w/keyboard*

1. Press the **EBL ON** key to display or activate an EBL (No. 1 or No. 2).
2. Put the cursor (+) on a target appearing as threatening (A in the figure below) by operating the trackball.
3. Push the **EBL OFFSET** key to anchor the EBL origin.
4. After waiting for a few minutes (at least 3 minutes), operate the EBL rotary control until the EBL bisects the target at the new position (A'). The EBL readout shows the target ship's course, which may be true or relative depending on the EBL bearing reference setting.
   **Note:** If relative motion is selected, it is also possible to read CPA by using a VRM as shown in left-hand figure below. If the EBL passes through the sweep origin (own ship) as illustrated in the right-hand figure below, the target ship is on a collision course.
5. To return the EBL origin to the own ship's position, push the **EBL OFFSET** key.

### *By trackball*

1. Display an EBL, following steps 1-3 in "By trackball" in section 2.12.1.
2. With the cursor inside the effective display area, spin the scrollwheel to show "Nav Marks" in the guidance area then push the right button.
3. Use the trackball to place the offset EBL on a target appearing as threatening (A in the figure below), spin the scrollwheel to show Offcenter REF pt then push the right button to anchor the EBL origin.
4. After waiting a few minutes (at least 3 minutes), operate the EBL used in step 1 until it bisects the target at the new position (A'). The EBL readout shows the target ship's course, which may be true or relative depending on the EBL bearing reference setting.

To deactivate the offset EBL and restore normal EBL operation, spin the scrollwheel to show the Nav Marks menu and check "Centered REF Pt".

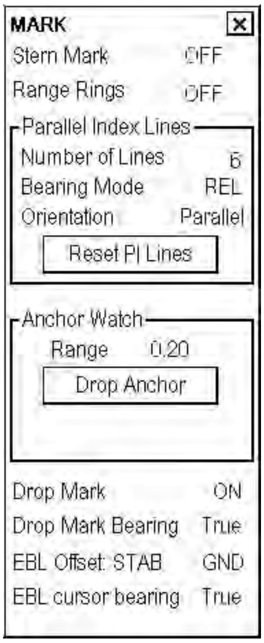



*Collision assessment by offset EBL*

## 2.14.2 How to select point of reference for origin point of offset EBL

The origin point of the offset EBL can be ground stabilized (geographically fixed), north stabilized (true) or referenced to own ship's heading (relative).

1. Use the trackball to select the MENU box at the right side of the screen.
2. Push the left button to display the Main menu.
3. Spin the scrollwheel to select Mark then push the scrollwheel.




4. Use the trackball to place the arrow on the setting of EBL Offset: STAB.
5. Spin the scrollwheel to select GND, N or HDG as appropriate then push the scrollwheel.
6. Click the Close window button (X) to close the Mark menu.

# 2.15 How to Measure Range and Bearing Between Two Targets

### *From the control unit w/keyboard*

1. Operate the trackball to place the origin of the No. 1 EBL, for example, on a target of interest (target 1 in the illustrated example).
2. Press the **EBL OFFSET** key.
3. Operate the EBL rotary control until the EBL passes through another target of interest (target 2).
4. Operate the VRM rotary control until the range marker on the EBL is on the inside edge of target 2. The active VRM readout at the lower-right corner of the screen indicates the distance between the two targets.

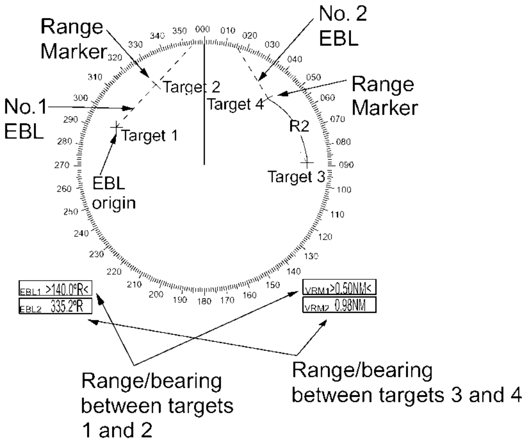
You can repeat the same procedure on third and fourth targets by using the No. 2 EBL and the No. 2 VRM.

Bearing is shown relative to own ship with suffix "R" or as a true bearing with suffix "T". To return the EBL origin to the screen center, push the **EBL OFFSET** key again.

### *By trackball*

1. Display an EBL, following steps 1-3 in "trackball" in section 2.12.1.
2. Push the **ENTER MAR**K key to open the Nav Marks dialog box.
3. Use the trackball to put the cursor on target 1, use the scrollwheel to show Offcenter REF pt in the guidance box then push the scrollwheel.
4. Put the cursor in the EBL box, spin the scrollwheel, and put the cursor on target 2.
5. Operate the No. 1 VRM until the range marker on the EBL aligns with target 2. The active VRM readout at the lower-right corner of the screen indicates the distance between the two targets.

You can repeat the same procedure on third and fourth targets by using the No. 2 EBL and the No. 2 VRM.




*Measuring range and bearing between two targets*

To return the EBL origin to the screen center, use the scrollwheel to show Centered Ref. Pt in the guidance area then push the right button.

# 2.16 How to Off-Center the Display

Own ship position, or sweep origin, can be displaced to expand the view field without switching to a larger range scale. The sweep origin can be off-centered to the cursor position, but not more than 75% of the range in use; if the cursor is set beyond 75% of the range scale, the sweep origin will be off-centered to the point of 75% of the limit. This feature is not available on ranges higher than 72 nm.

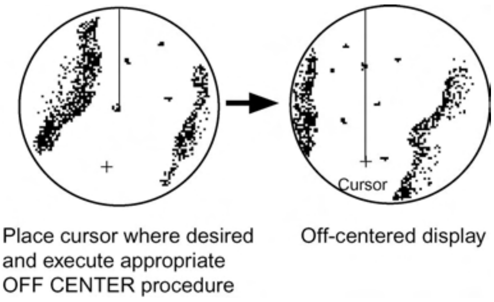
**Note 1:** If the position of the CCRP results in a part of the bearing scale not being distinguishable, that part of the bearing scale is indicated with appropriate reduced detail.

**Note 2**: When the reference point is set for "conning position (CCRP) and the position of the antenna is more than 75% of the effective radius, offcenter is not cancelled on short ranges.

To off-center the radar picture, do the following:

### *From the control unit w/keyboard*

1. Use the trackball to put the cursor at a position where you wish to move the sweep origin.
2. Push the **OFF CENTER** key. The sweep origin is off-centered to the cursor position.
3. To cancel off-centering, push the **OFF CENTER** key again.




### *By trackball*

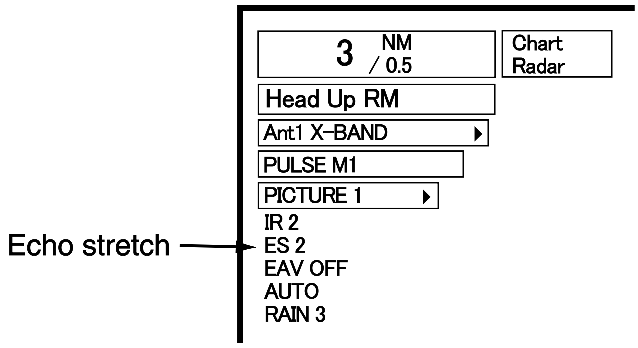
1. With the cursor inside the effective display area, spin the scrollwheel to display "TM Reset/Info/Ship Offcenter" in the guidance area.
2. Use the trackball to put the cursor where you want to locate the screen center.
3. Push the right button to off center the sweep origin.
4. To cancel the off-center function, show "TM Reset/Info/Ship Offcenter" in the guidance area then push the right button.

# 2.17 Echo Stretch

The echo stretch feature enlarges targets in the range and bearing directions to make them easier to see, and it is available on any range. There are three types of echo stretch, 1, 2 and 3, and the higher the number the greater the amount of stretching.

The echo stretch magnifies not only small target pips but also returns (clutter) from sea surface, rain and radar interference. For this reason, make sure these types of interference have been sufficiently suppressed before activating the echo stretch.

1. Use the trackball to select the ES indication at the left side of the screen.
2. Push the left button to select the echo stretch level desired. The indication changes in the sequence of OFF, 1, 2, and 3.



## 2.18 Echo Averaging

The echo average feature effectively suppresses sea clutter. Echoes received from stable targets such as ships appear on the screen at almost the same position every rotation of the antenna. On the other hand, unstable echoes such as sea clutter appear at random positions.

To distinguish real target echoes from sea clutter, echoes are averaged over successive picture frames. If an echo is solid and stable, it is presented in its normal intensity. Sea clutter is averaged over successive scans resulting in reduced brilliance, making it easier to discriminate real targets from sea clutter.

Echo averaging uses scan-to-scan signal correlation technique based on the true motion over the ground of each target. Thus, small stationary targets such as buoys will be shown while suppressing random echoes such as sea clutter. True echo average is not however effective for picking up small targets running at high speeds over the ground.

**Note 1:** With echo average active it is harder to detect high-speed targets than stationary ones.

**Note 2:** Do not use the echo averaging function under heavy pitching and rolling; loss of targets can result.

**Note 3:** Echo averaging can be used without a heading sensor. For further details, contact your dealer.

**Note 4:** Echo averaging requires heading, position and speed data.

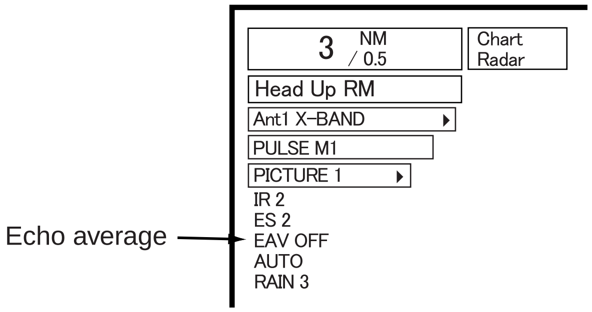
Before using the echo averaging function, reduce sea clutter with the **A/C SEA** control. Leave a little sea clutter on the screen so as not to erase weak targets. Then, do as follows:

Select EAV at the left side of the screen, then push the left button to choose setting.

OFF: Echo averaging OFF

1, 2: Detects targets hidden in sea clutter. "2" is more effective than "1" in detecting targets hidden in strong sea clutter. However, "1" is more effective than "2" in displaying high speed targets. Select the setting best suited to current conditions. For effective monitoring of high-speed craft, you should use "2" together with Wiper.

3: Stably displays unstable targets; distinguish high-speed craft from sea clutter.



# 2.19 Target Trails

The trails of the radar echoes of targets may be displayed in the form of synthetic afterglow. Target trails are selected either relative or true and may be sea or ground stabilized. True motion trails require a compass signal, position and speed inputs.

## 2.19.1 True or relative trails

You can display echo trails in true or relative motion. Relative trails show relative movements between targets and own ship. True motion trails require a gyrocompass signal, speed data and position data.

The reference for the past position displays for AIS and TT is also switched whenever trail reference is switched.

1. Use the trackball to place the arrow on the TRAIL MODE box at the bottom right corner of the screen.
2. Spin the scrollwheel to select TRUE or REL as appropriate then push the scrollwheel.

(a) True target trails (no smearing of stationary targets)

(b) Relative target trails Target moving relative to own ship

## 2.19.2 Trail time

Trail time, the trail plotting interval, may be selected as follows:

1. Use the trackball to place the arrow on the TRAIL TIME box at bottom-right corner on the screen.
2. Push the left button, **TRAILS** key or the scrollwheel to choose trail time, referring to the table below. The longer the trail interval, the longer the lengths of the target trail

| Control | Available setting |
|---|---|
| Left button, TRAILS key | OFF, 15 sec, 30 sec, 1 min, 3 min, 6 min, 15 min, 30 min, CONT(inuous) |
| Scrollwheel | OFF, 15 sec, 30 sec, 1-30 min (30 sec intervals), CONT(inuous) |

The timer above the TRAIL MODE box counts up the trail time and is erased once the terminal count is reached. For example, if the trail time is six minutes, the timer is erased when trails have been plotted six minutes. The maximum time for continuous plotting is 99:59. When the timer counts to 99:59, the timer is reset to zero, all target trails are erased then trails are restarted.

## 2.19.3 How to reset target trails

You can clear all target trails to restart the trail process. Target trails are cleared and the trailing process restarts from time count zero at the current target trail plot interval.

1. Use the trackball to place the arrow on the TRAIL TIME box at the bottom right corner of the screen. The guidance area reads "Trail SEL/L=Delete / OK /.
2. Long-push the left button or the **CANCEL TRAILS** key to reset target trails.

## 2.19.4 How to temporarily remove trails

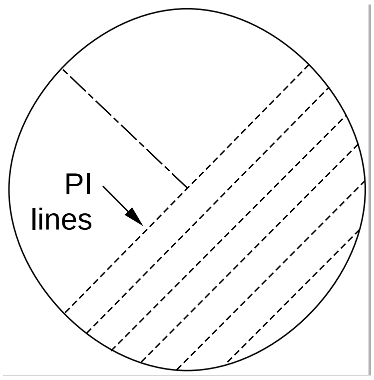
Trails can be temporarily removed as follows:

1. Use the trackball to select the TRAIL TIME box at the bottom right corner of the screen.
2. Push the left button to display OFF.

## 2.20 Parallel Index (PI) Lines

PI lines are useful for keeping a constant distance between own ship and a coastline or a partner ship when navigating. Up to six sets of PI lines are available depending on the maximum number of PI lines selected on the menu.

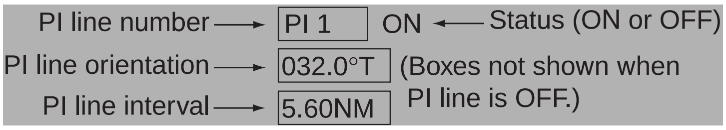
You can control the orientation and interval of the PI lines from the PI line box, which is at the lower left corner.




*PI lines*

### *How to show PI lines*

1. Put the cursor on OFF next to PI1 or PI2 at the left side of the display.
2. Spin the scrollwheel to display ON then push the scrollwheel.




*IL (Index Line) box*

3. Use the scrollwheel to set index line orientation and line interval.
4. To switch between PI1 and PI2, put cursor on the PI line number box and spin the scrollwheel to show desired PI line number.
5. To erase a PI line, select ON to the right of a PI line number, spin the scrollwheel to select OFF then push the left button.
6. For operation with keyboard the **INDEX LINE** key switches active PI line.

### *PI line bearing reference*

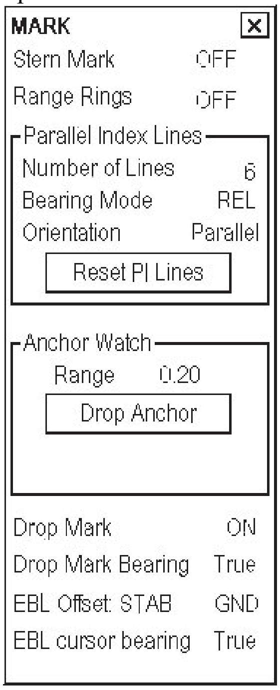
PI line bearing reference may be relative to own ship’s heading (Relative) or referenced to North (True) as follows:

Open the menu and select the Mark menu. Set Bearing Mode to Relative or True with Bearing Mode.

### *How to select maximum number of PI lines to display*

The maximum number of PI lines to display may be selected from 2, 3 or 6 lines as below. The actual number of lines visible may be less depending on line interval.

1. Use the trackball to select the MENU box at the right side of the screen. The guidance area at the bottom right corner (see the illustration at the bottom of the next page for location) now reads "MENU."
2. Push the left button to display the Main menu.
3. Spin the scrollwheel to select Mark then push the scrollwheel.




4. Use the trackball to select Number of Lines.
5. Spin the scrollwheel to select 1, 2, 3 or 6 as appropriate then push the scrollwheel.
6. Click the Close window button (X) on the menu to close the menu.

### *PI line mode*

PI lines orientation may be selected from parallel or perpendicular. This function is available when Number of Lines in the Parallel Index Line window is set for other than "1".

1. Use the trackball to select the MENU box at the right side of the screen.
2. Push the left button to display the Main menu.
3. Spin the scrollwheel to select Mark then push the scrollwheel.
4. Use the trackball to select the setting of Orientation.
5. Spin the scrollwheel to select Perpendicular or Parallel as appropriate then push the scrollwheel.
6. Click the Close window button (X) on the menu to close the menu.

### *How to reset PI lines*

You can automatically return PI lines to default orientation, 0-degrees for parallel orientation, 90-degrees for perpendicular orientation. This is faster than doing it manually. Open the Mark menu and click the **Reset PI Lines** button.

# 2.21 Markers

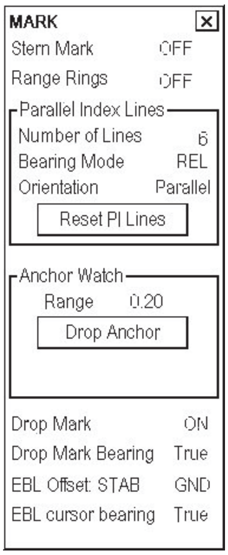
### *Heading marker and heading line*

The heading marker and the heading line indicate the ship's heading in all presentation modes. The heading line is a line from the own ship position to the outer edge of the radar display area and appears at zero degrees on the bearing scale in head-up mode. It changes its orientation depending on the ship orientation in north-up and true motion modes. The heading marker is a small circle on the bearing scale to indicate the heading.

#### Temporarily erasing the heading line

To temporarily extinguish the heading line to look at targets existing dead ahead of own ship, push the **HL OFF** key on the control unit w/keyboard, or use the trackball to select the HL OFF box at the bottom left corner of the display then push the left button. In addition to the heading line, the stern marker and all graphics within the effective display are also erased. To redisplay the heading line, etc., release the key or the left button.

### *Stern marker*




The stern marker, which is a dot-and-dash line, appears opposite to the heading line. To display or erase this marker, do the following:

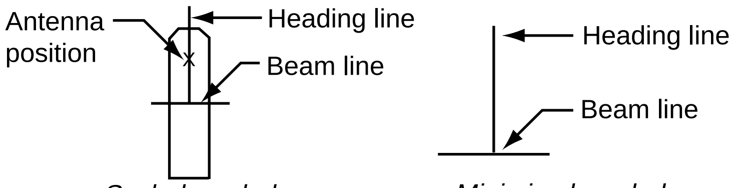
1. Use the trackball to select the MENU box at the right side of the display then push the left button to display the Main menu.
2. Spin the scrollwheel to select Mark then push the scrollwheel.
3. Use the trackball to select the setting of Stern Mark.
4. Spin the scrollwheel to select Off or On as appropriate then push the scrollwheel.
5. Click the Close window button (X) on the menu to close the menu.

### *North marker*

The north marker appears as a short dashed line. In the head-up mode, the north marker moves around the bearing scale in accordance with the compass signal.

### *Own ship symbol*

The own ship symbol marks own position on the display. It can be turned on or off and its configuration selected from the General page of the Symbol Display dialog box. Two configurations are available: minimized symbol and scaled symbol. The scaled symbol is scaled to indicate the length and beam of the vessel. If the beam width or length of the symbol (set at installation) gets smaller than 6 mm, the symbol will disappear and own ship will be with a minimized symbol. Ship's dimensions should be entered at installation to use the scaled ship symbol.




*Scaled symbol* *Minimized symbol*

1. Use the trackball to select the Symbol DISP box at the right side of the display then push the left button.
2. Select the General page.
3. Use the trackball to select the setting of Ship outlines.
4. Spin the scrollwheel to select Off or On as appropriate then push the scrollwheel.
5. Use the trackball to select the setting of Own ship limit.
6. Spin the scrollwheel to select Beam width or Length as appropriate then push the scrollwheel.
7. Click the Close window button (X) to close the menu.

## 2.22 Automatic Picture Setup According to Navigation Purpose

Every time your navigating environment or task changes, you must adjust the radar, which can be a nuisance in a busy situation. Instead of changing radar settings case by case, it is possible to assign the function keys to provide optimum settings for often-encountered situations.

The radar's internal computer offers several picture setup options to be assigned to each function key for your specific navigating requirements. For instance, one of the functions is assigned to detect ships and labeled SHIP on the PICTURE box. By choosing SHIP, the radar will be instantly set for optimum detection of ships.

Four user-programmable setups are also provided (labeled PICTURE1-PICTURE4), so that you can have the radar automatically adjusted to those conditions that are not covered by the provided setup options.

Below are the preset picture setup options provided with this radar.

*Picture setup options description*

| Label | Description | Label | Description |
|---|---|---|---|
| NEAR | Optimum setting for short range detection using a range scale of 3 nm or less on calm seas | FAR | Optimum setting for long range detection using a range scale of 6 nm or larger |
| NEAR BUOY | Optimum setting for detecting navigation buoys, small vessels and other small surface objects at close range | FAR BUOY | Optimum setting for detecting navigation buoys, small vessels and other small surface objects at long range |
| ROUGH SEA | Optimum setting for rough weather or heavy rain | SHIP | Optimum setting for detecting vessels |
| HARBOR | Optimum setting for short range navigation in a harbor area using a range scale of 1.5 nm or less | COAST | For coastal navigation using a range of 12 nm or less |

Each picture setup option defines a combination of several radar settings for achieving optimum setup for a particular navigating situation. These include interference rejector, echo stretch, echo average, noise rejector, automatic anti-sea and anti-rain clutters, video contrast, pulse length and sea and radar conditions.

Adjusting these features from the PICTURE menu changes the original function key settings. To restore the original settings for a particular picture setup option, it is necessary to select the default setting. For this reason, we recommended that you use the user-programmable function sets when frequent adjustment of the radar image is necessary.

| PICTURE | PICTURE1 | PICTURE2 | PICTURE3 | PICTURE4 | NEAR | FAR | NEAR BUOY | FAR BUOY |
|---|---|---|---|---|---|---|---|---|
| **Filters** | | | | | | | | |
| Int Reject | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Echo Stretch | Off | 2 | Off | Off | Off | 2 | 1 | 2 |
| Echo Average | Off | 1 | 2 | Off | Off | 3 | 1 | 3 |
| Noise Rej | Off | Off | Off | Off | Off | On | Off | On |
| Auto Stc | Off | Off | Off | Off | Off | Off | Off | Off |
| Auto Rain | Off | Off | Off | 2 | Off | Off | Off | Off |
| Video Contrast | B1 | B2 | B1 | A2 | B2 | B3 | B2 | B3 |
| **Pulse** | | | | | | | | |
| 0,5 NM | S1 | S2 | S1 | S1 | S1 | S2 | S2 | S2 |
| 0,75 NM | S2 | S2 | S2 | S2 | S1 | M1 | M1 | M1 |
| 1,5 NM | S2 | M1 | S2 | S2 | S2 | M1 | M1 | M1 |
| 3 NM | M1 | M2 | M1 | M1 | M1 | M3 | M2 | M3 |
| 6 NM | M2 | M3 | M2 | M2 | M2 | L | L | L |
| 12 - 24 NM | L | L | L | L | L | L | L | L |
| **Condition** | | | | | | | | |
| Sea Condition | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 2 |
| Ant Height* | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Low Level Echo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(Each PICTURE window has Save, User and Factory buttons.)

* Antenna height is set on the Radar Initialize menu at installation.

*Picture setup options and default settings*

| PICTURE | ROUGH SEA | SHIP | HARBOR | COAST |
|---|---|---|---|---|
| **Filters** | | | | |
| Int Reject | 2 | 2 | 2 | 2 |
| Echo Stretch | Off | 2 | Off | Off |
| Echo Average | 2 | Off | Off | Off |
| Noise Rej | Off | Off | Off | Off |
| Auto Stc | Off | Off | Off | Off |
| Auto Rain | Off | Off | Off | Off |
| Video Contrast | A2 | B2 | B2 | B2 |
| **Pulse** | | | | |
| 0,5 NM | S1 | S1 | S1 | S1 |
| 0,75 NM | S1 | S2 | S1 | S2 |
| 1,5 NM | S2 | M1 | S2 | M1 |
| 3 NM | M1 | M2 | M1 | M2 |
| 6 NM | M2 | M3 | M3 | M3 |
| 12 - 24 NM | M3 | L | L | L |
| **Condition** | | | | |
| Sea Condition | 4 | 2 | 2 | 2 |
| Ant Height * | 5 | 5 | 5 | 5 |
| Low Level Echo | 0 | 0 | 0 | 0 |
| | Save / User / Factory | Save / User / Factory | Save / User / Factory | Save / User / Factory |

* Antenna height is set on the Radar Initialize menu at installation.

*Picture setup options and default settings (con't)*

## 2.22.1 How to select a picture setup option

You can select a picture setup option as follows:

1. Use the trackball to select the PICTURE box at the left side of the screen.

   NEAR BUOY* ▸

   * Other indications:
   NEAR, FAR, NEAR BUOY,
   FAR BUOY, ROUGH SEA,
   SHIP, HARBOR, COAST,
   PICTURE 1 - PICTURE 4

   *PICTURE box example*

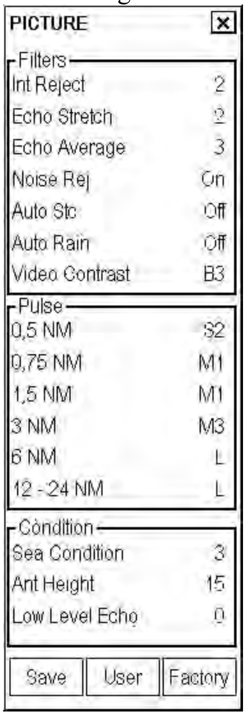
2. Push the left button to select picture setup option desired.

## 2.22.2 User-programmable picture setups

Four user-programmable picture setups are provided and they are labeled PICTURE 1 – PICTURE 4 in the PICTURE box. You can program them as below.

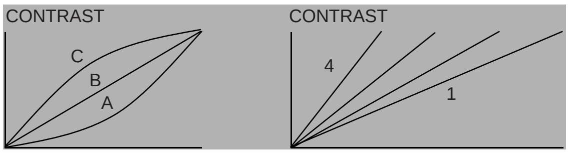
1. Use the trackball to select the PICTURE box at the left side of the screen.
2. Push the left button to select PICTURE 1, PICTURE 2, PICTURE 3 or PICTURE 4, whichever you wish to set.

3. Push the right button to show the PICTURE menu.




*PICTURE menu*

4. Set the items below referring to the sections shown.
   Int Reject: 2.10 — Auto STC: 2.8
   Echo Stretch: 2.17 — Auto Rain: 2.9
   Echo Average: 2.18 — Pulse length: 2.13
   Noise Rej 2.23
5. Use the trackball to select Video Contrast then push the scrollwheel.
6. Spin the scrollwheel to select 1, 2, 3 or 4 (Dynamic Range) or A, B, C (Curve) as appropriate then push the scrollwheel. Refer to the description and illustration below.
   **1-4:** Control dynamic range. 1 provides the widest dynamic range; 4 is the narrowest dynamic range.
   **A:** Mid-level in the curve is low, so this setting is suitable for suppressing rain clutter.
   **B:** Curve between A and C.
   **C:** Mid-level in the curve is high, so this setting is suitable for detecting distant targets.




*Video contrast settings*

7. Use the trackball to select Sea Condition then push the scrollwheel.
8. Spin the scrollwheel to select appropriate sea condition then push the scrollwheel. The larger the number the rougher the sea state.
9. Use the trackball to select Ant Height then push the scrollwheel.
10. Spin the scrollwheel to select appropriate radar antenna height (above the waterline) then push the scrollwheel.
11. If necessary, select Low Level Echo to reject low level echoes. The setting range is 0-8. The higher the figure, the stronger the low level echo that is erased.
12. To save a program, click the Save button.
13. Click the Close window button (X) to close the PICTURE menu.

### 2.22.3 How to restore user settings

If you get lost in operation while adjusting the settings for a picture setup, you can easily restore user settings for that picture setup. Note that user settings are deleted when default settings are restored.

1. Left-click the PICTURE box at the left side of the screen to select the picture setup option for which you want to restore its user settings.
2. Push the right button to show the PICTURE menu.
3. Click the User button.
4. Click the Close window button (X) to close the PICTURE menu.

### 2.22.4 How to restore default picture setup options

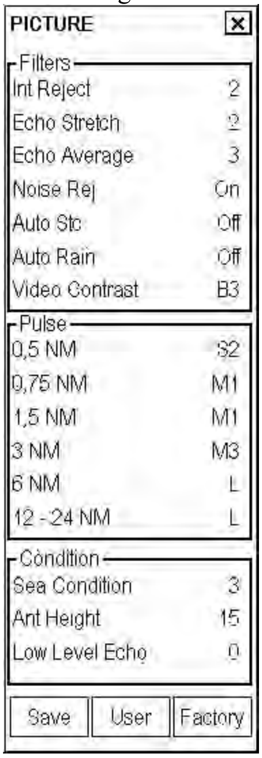
Any of the radar functions programmed with the picture setup options may be adjusted as desired. If you get lost in operation and want to restore the default settings for a particular picture setup operation, do the following:

1. Left-click the PICTURE box at the left side of the screen to select the picture setup option for which you want to restore its user settings.
2. Push the right button to show the PICTURE menu.
3. Click the Factory button.
4. Click the Close window button (X) to close the PICTURE menu..

## 2.23 Noise Rejector

White noise may show itself on the screen as random "speckles" spread over the entire radar image. You can remove this noise as follows:

1. Use the trackball to select the PICTURE box at the left side of the screen.
2. Push the right button to show the PICTURE menu.

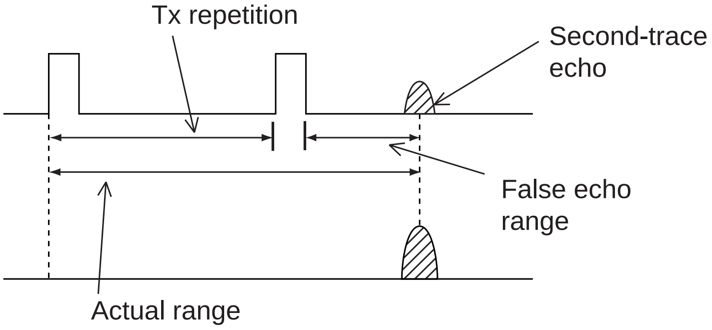


*PICTURE menu*

3. Use the trackball to select the setting of Noise Rej.
4. Spin the scrollwheel to select On or Off as appropriate then push the scrollwheel.
5. Click the Close window button (X) to close the PICTURE menu.

## 2.24 How to Suppress Second-trace Echoes

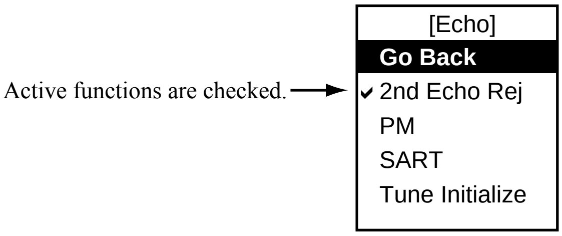
In certain situations, echoes from very distance targets may appear as false echoes (second-trace echoes) on the screen. This occurs when the return echo is received one transmission cycle later, or after a next radar pulse has been transmitted.




*Second-trace echo*

To reject second-trace echoes:

1. Use the trackball to select the MENU box at the right side of the screen then push the left button.
2. Spin the scrollwheel to select Echo then push the scrollwheel to open the Echo menu.
3. Spin the scrollwheel to select 2nd Echo Rej then push the scrollwheel.

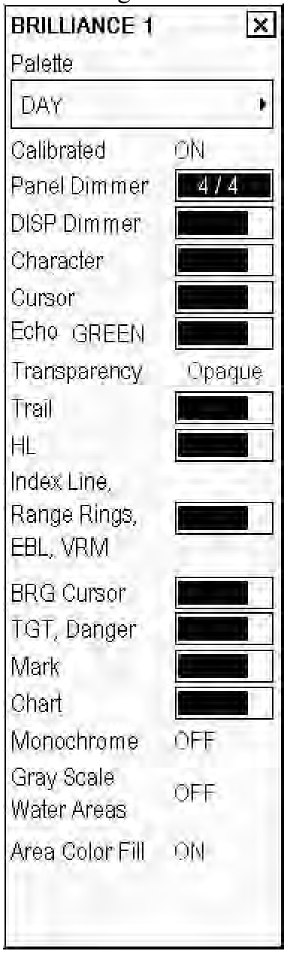



4. Spin the scrollwheel to check (activate) or uncheck (deactivate) 2nd Echo Rej as appropriate then push the scrollwheel.
5. Echo menu will close automatically.

## 2.25 How to Adjust Brilliance of Screen Data

You can adjust relative brilliance levels of various markers and alphanumeric readouts displayed on the screen. Adjustment can be done Brilliance 1 - Brilliance 4 independently.

1. Use the trackball to select the BRILL box at the bottom left corner of the screen.
2. Push the right button to show the BRILL dialog box.




3. Use the trackball to select the level indicator of the item you wish to adjust then push the scrollwheel.
4. Spin the scrollwheel to set brilliance level.
5. Click the Close window button (X) to close the PICTURE menu.

## 2.26 Watch Alarm

The watch alarm function sounds the buzzer at set intervals to alert the operator to view the radar picture. When the watch alarm is active, the WATCH box appears at the bottom left of the screen. The timer in the box is displayed until the buzzer sounds.

The WATCH box appears" at the right side of the screen with a watch alarm timer that counts down from value set (for example, "12:00").

*Watch box*

When a preset time interval has elapsed, the audio watch alarm sounds, the screen label WATCH turns red and the watch alarm timer freezes at "0:00." To silence the alarm, push the **ALARM ACK key** on the full keyboard or use the trackball to select the ALARM ACK box then push the left button. The normal color for the WATCH label is restored and the watch alarm timer is reset to the initial value and starts the count-down sequence again.

If you push the **ALARM ACK key** or click the box with the left button before the selected time interval is reached, the watch alarm timer is reset to the initial value and the count-down sequence is restarted.

To set watch time interval:

1. Use the trackball to select the MENU box at the right side of the screen then push the left button.
2. Spin the scrollwheel to select Alarms then push the scrollwheel.

3. Use the trackball to select the value of Watch Alarm. Spin the scrollwheel to select appropriate time interval then push the scrollwheel.
4. Close the Alarms menu by clicking the Close window button (X) at the upper right corner of the menu.

## 2.27 Interswitch

The interswitch of this radar uses an Ethernet to transfer video and control signals. A digital signal transfers the video and control signals. You can connect four antennas and eight display units. Set radar display and antenna groups from the ANTENNA SELECT display.

When you switch to a different antenna, the heading skew and timing adjustment (set at installation) for that antenna is automatically applied.

The ANTENNA box at the upper left position shows current antenna selection.

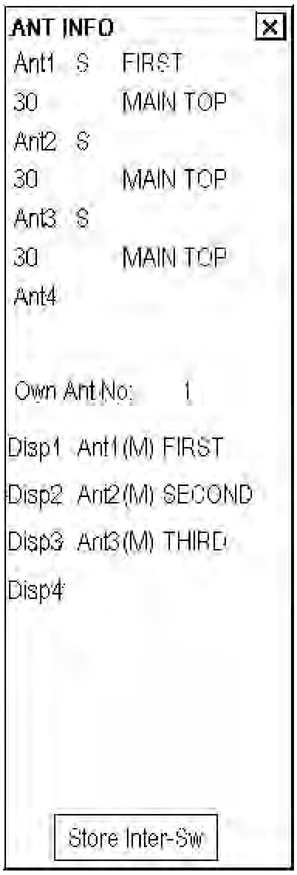
**Note:** When network error is found, the message "Connection lost to Radar CPU" or "LAN Radar conn error" appears. To restore normal operation, reset the power of all equipment connected to the network. Recheck the network (LAN cable, HUB, etc.), reset the power of the radar, and re-enter Interswitch settings.

### 2.27.1 How to show antenna information

The ANTENNA INFO display shows:

- Radar band, output power and antenna position of each antenna currently powered. (If an antenna is not powered, its data area is blank.)
- Current antenna and display combinations.
- Your radar number

To show the ANTENNA INFO display, right-click the ANTENNA box.



### 2.27.2 How to preset antenna and display combinations

You can preset the antenna and display combinations for each antenna and display in the radar system. As an example, the procedure below shows how to select the no. 1 antenna unit for the no. 2 display unit.

1. Right-click the ANTENNA box to show the ANT INFO display.

2. Select the display unit for which to select an antenna (at the next step). For example, select Disp2 to select the no. 2 display unit.
3. The cursor is now selecting the current display and antenna combination for the no. 2 display unit. Roll the scrollwheel to display Ant1(M) then push the left button.
4. Repeat step 3 and 4 to set other display and antenna combinations.
5. Click Store Inter-SW.
6. Push the right button to close the menu.

### 2.27.3 Antenna selection considerations

- An antenna unit cannot be controlled from multiple display units. Select one MASTER display unit for one antenna unit. If two antenna units are set as masters, the display last-set as master becomes the master and all other displays are automatically changed to slave.
- Radar functions are controlled independently, dependently or commonly depending on selection as Master or Slave.
- An antenna unit without a MASTER display cannot be selected on the sub display units. If there is no antenna unit set as master, the lowest number display is automatically set as master.

| RADAR FUNCTIONS | CONTROL | MASTER DISPLAY OPTION | SLAVE DISPLAY OPTION |
|---|---|---|---|
| AIS function | Independent | Desired value can be set | Desired value can be set |
| Brilliance | Independent | Desired value can be set | Desired value can be set |
| Echo stretch | Independent | Desired value can be set | Desired value can be set |
| Echo averaging | Independent | Desired value can be set | Desired value can be set |
| Echo trails | Independent | Desired value can be set | Desired value can be set |
| EBL | Independent | Desired value can be set | Desired value can be set |
| Lat/long data | Independent | Desired value can be set | Desired value can be set |
| Presentation mode | Independent | Desired value can be set | Desired value can be set |
| Speed data | Independent | Desired value can be set | Desired value can be set |
| TT, AIS on/off | Independent | Desired value can be set | Desired value can be set |
| TT, AIS track interval | Independent | Desired value can be set | Desired value can be set |
| Vector mode | Independent | Desired value can be set | Desired value can be set |
| Vector time | Independent | Desired value can be set | Desired value can be set |
| VRM | Independent | Desired value can be set | Desired value can be set |
| Range (Sampling at Master) | Dependent control | (Echo sampling at master range) | |
| A/C SEA | Dependent control | Desired value can be set | Cannot control |
| A/C RAIN | Dependent control | Desired value can be set | Cannot control |
| Auto Rain | Dependent control | Desired value can be set | Cannot control |
| Gain | Dependent control | Desired value can be set | Cannot control |
| IR | Dependent control | Desired value can be set | Cannot control |
| Picture setting | Dependent control | Desired value can be set | Cannot control |
| STBY/TX | Dependent control | Desired value can be set | Cannot control |
| Tuning | Dependent control | Desired value can be set | Cannot control |
| Reference point | Dependent control | Desired value can be set | Cannot control |
| TT LOST alarm | Common control | Item commonly controlled | Item commonly controlled |
| TT COLLISION alarm | Common control | Item commonly controlled | Item commonly controlled |
| TT alarm ACK | Common control | Item commonly controlled | Item commonly controlled |
| TT acquire | Common control | Item commonly controlled | Item commonly controlled |
| TT/AIS AZ | Common control | Item commonly controlled | Item commonly controlled |

- If the message "CONNECTION LOST TO RADAR CPU" or "LAN RADAR CONN ERROR" appears, do one of the following as applicable:
  - If only your antenna is not displayed on the ANTENNA SELECT display, LAN line in your processor may be faulty. In this case, use the standalone mode.
  - If the antenna that was in use does not appear on the ANTENNA SELECT display, LAN line in other processor unit may be faulty. In this case, see section 2.27.2 for how to select a different antenna unit.
- When the Network fails, the Interswitch does not work, but standalone operation is possible.

### 2.27.4 How to select an antenna

For the ship that carries multiple antennas, you can choose the antenna to use as follows:

1. Roll the trackball to place the arrow in the ANTENNA box at the left side of the screen.

   Ant1(M) X-BAND ▶

2. Roll the scrollwheel to choose an antenna then push the left button.

## 2.28 Performance Monitor

A performance monitor, incorporated in the antenna unit, is required for a radar installed on vessels of 300 GT and upward engaged in international voyages. Two units are available:

- X-band radar PM-31 (9410 ± 45 MHz)
- S-band radar PM-51 (3050 ± 30 MHz)

### *How to activate, deactivate the performance monitor*

1. Use the trackball to select the MENU box then push the left button.
2. Spin the scrollwheel to select Echo then push the scrollwheel.

*Echo menu*

3. Spin the scrollwheel to select PM then push the scrollwheel. Check to activate, uncheck to deactivate.

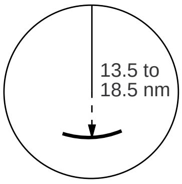
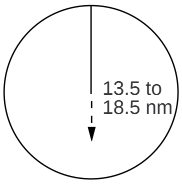
"PM" appears on the display when the performance monitor is active.

### *How to check radar performance*

1. The radar is automatically set up as follows:
   Range: 24 nm
   Pulse Length: Long
   Blind Sector: Off
   A/C Sea: Off
   A/C Rain: Off
   Echo Stretch: Off
   Echo Average: Off
   Video Contrast: B1
   Tune: Auto
   Gain: Initial setting (as set with PM GAIN ADJ at installation)
2. Turn on the performance monitor referring to procedure shown above.
3. After observing the results turn off the performance monitor.

The range scale is automatically set to 24 nm. The radar screen will show one or two arcs. If the radar transmitter and receiver are in good working order in as much as the original state when the monitor was turned on, the innermost arc should appear between 13.5 and 18.5 nm. The performance monitor can observe a total of 10 dB loss in transmitter and receiver.

**Note:** The lengths and location of the arcs may vary according to the direction in which the antenna unit is installed. Judge the strength of the echo that appears within 60° from arc location to confirm if the radar is working properly or not.

| Display | State |
|---|---|
|   | Tx: Normal<br>Rx: Normal |
|   | Tx, Rx:<br>No arc appears when attenuation is 10dB.<br>Replace magnetron. |

## 2.29 Color and Brilliance Sets

This radar provides three sets of color and brilliance sets (palette) to match any ambient lighting condition. The default specifications of each brilliance set is as shown in the table below.

| Palette | Display Brilliance | | Panel Dimmer | Others | Text Color | Background/ Circle |
|---|---|---|---|---|---|---|
| | FCR-2107 | FCR-2807 | | | | |
| Day | 45 | 65 | 4 | 12 | White | Gray/Black |
| Day-Blue | 45 | 65 | 4 | 12 | White | Blue/Black |
| Dusk | 25 | 55 | 2 | 12 | White | Gray/Black |
| Dusk-Blue | 25 | 55 | 2 | 12 | White | Blue/Black |
| Night | 8 | 24 | 1 | 12 | White | Gray/Black |

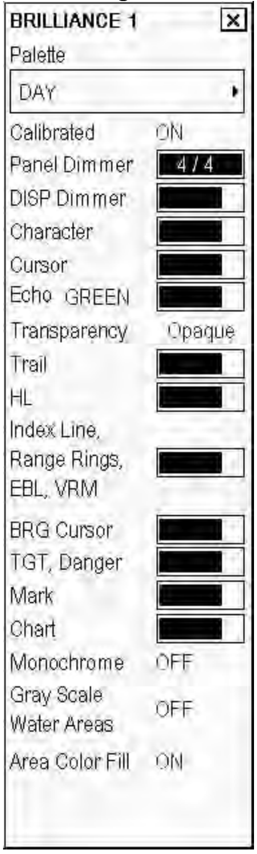
**Note:** The above default settings are restored whenever the setting for Calibrated is ON.

### *How to select color and brilliance set*

1. Use the trackball to select the BRILL box at the left side of the screen.
2. Spin the scrollwheel to select color and brilliance set from among BRILL1 – BRILL4.
3. Push the scrollwheel to finish.

### *How to preset brilliance set*

1. Use the trackball to select the BRILL box at the left side of the screen.
2. Push the right button to open the BRILLIANCE menu.




*BRILLIANCE menu*

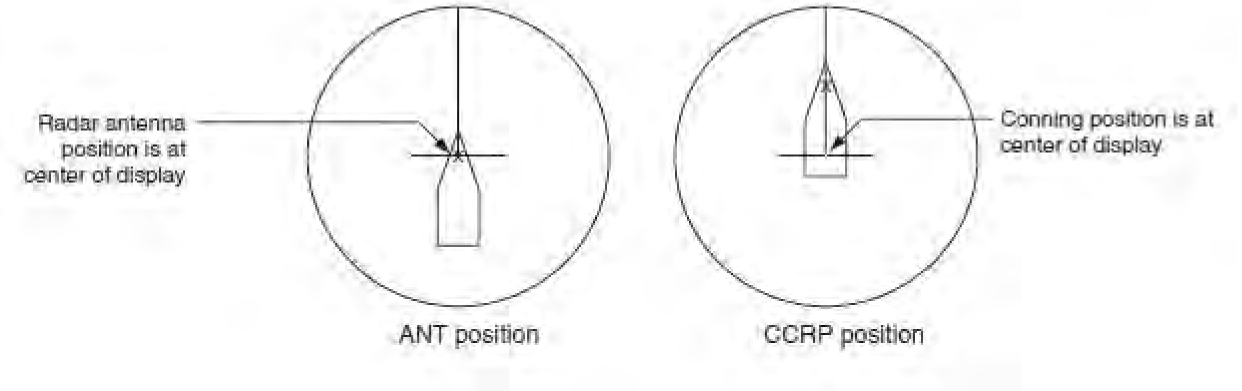
3. Set the cursor on the level indicator of the item you wish to adjust and spin the scrollwheel to adjust.
4. Click the Close window button (X) to close the BRILLIANCE menu.

## 2.30 Reference Position

The reference position for measurements (range, bearing, etc.) and markers (heading line, stern mark, etc.) can be antenna position or consistent common reference point (CCRP), which is a location on own ship to which all horizontal measurements, for example range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA), are normally referenced.

To select reference position, left-click the REF POINT indication at the top of the screen to select ANT or CCRP as applicable.

The position of the own ship marker changes according to reference position as shown below. If the CCRP is positioned outside of the effective display area, the bearing scale is indicated with the appropriate reduced detail.



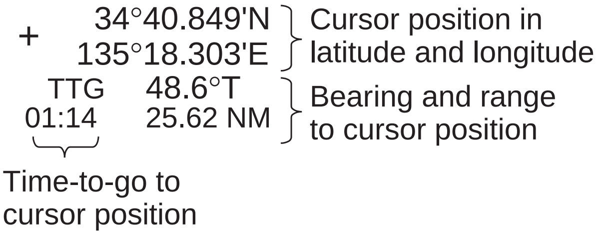

Range and bearing are measured and graphics are drawn according to reference position as in the table below.

*Markers, measurements and reference point*

| Category | Item | Reference point: CCRP | Reference point: Antenna position |
|---|---|---|---|
| Range and bearing measurement | EBL | Range and bearing measured from CCRP | Range and bearing measured from antenna position |
| | VRM | | |
| | Cursor | | |
| | PI line | | |
| | Range ring | | |
| | Drop mark | | |
| Graphics | Heading line | Drawn from CCRP | Drawn from antenna position |
| | Stern mark | | |
| | Beam line | | |
| | Own ship vector | | |
| | Own ship track | | |
| Bearing cursor | | Drawn with CCRP at center | Drawn with antenna position at center |
| Course, speed | | Calculated with CCRP at center | Calculated with antenna position at center |
| CPA, TCPA | | Calculated with CCRP at center | Calculated with antenna position at center |
| BCR, BCT | | Calculated from bow position | |
| Own ship data | Heading | Data from sensor, regardless of reference point selected | |
| | Speed | | |
| | Course over ground | | |
| | Speed over ground | | |
| | Own L/L | | |

## 2.31 Cursor Position Data

Cursor position data is shown at the top right side of the radar display.




To show Time-to-go data:

1. Open the main menu followed by the Initial Settings menu.
2. Put the cursor on the triangle in the menu to show the Operation menu.
3. Put the cursor on TTG Display.
4. Select Off, Ground Speed, or Water Speed.

## 2.32 Drop Mark

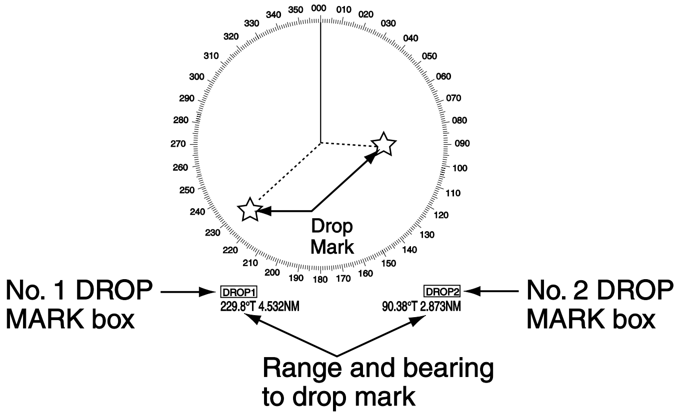
The operator inscribes a drop mark (☆) at a selected location to find the range and bearing from own ship to the mark. This can be useful for marking a point to avoid while navigating to a destination.

### *How to activate the drop mark feature*

1. Open the main menu followed by the Mark menu.
2. Set the cursor Drop Mark then spin the scrollwheel to select On or Off as appropriate.
3. Click the X at the top right corner to close the window.

### *How to inscribe a drop mark*

1. Left-click one of the DROP MARK boxes at the bottom of the screen.
2. Put the cursor on the point you want to measure the range and bearing then push the left button. A drop mark is inscribed on the screen and range and bearing between own ship and the drop mark are shown below corresponding DROP MARK box.




### *How to erase a drop mark*

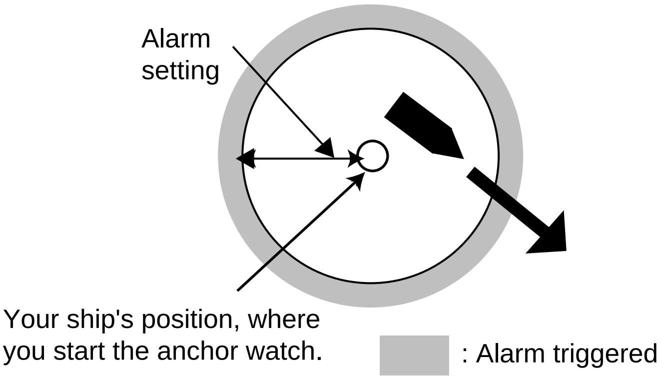
Left-click the appropriate DROP MARK box until the drop mark and its data are erased. (The DROP MARK box remains on the screen until the drop mark feature is turned off from the menu.)

### *Drop mark bearing reference*

The bearing of a drop mark can be reference to True or Relative. Open the main menu followed by the Mark menu. Set the cursor on the setting of Drop Mark Bearing then spin the scrollwheel to select True or Relative.

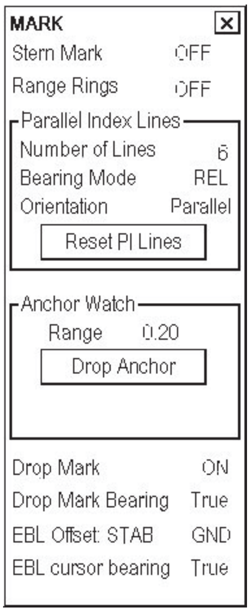
## 2.33 Anchor Watch

Anchor watch is used to monitor how vessel is staying at anchor. You are able to set limit for movement of vessel at anchor (Drag circle). If your vessel travels more than the distance set here, the alert "**874: Anchor watch**" appears.




### *How to activate anchor watch*

1. Open the main menu followed by the Mark menu.




2. Enter desired range value (0.01-9.99(nm)) for the anchor watch in the Range field.
3. Drop the anchor then click the **Drop Anchor** button. The **Start Anchor Watch** button appears below the **Drop Anchor** button.
4. Click the **Start Anchor Watch** button to start the anchor watch.

### *How to deactivate anchor watch*

1. Open the main menu followed by the Mark menu.
2. Click the **Stop Anchor Watch** button.

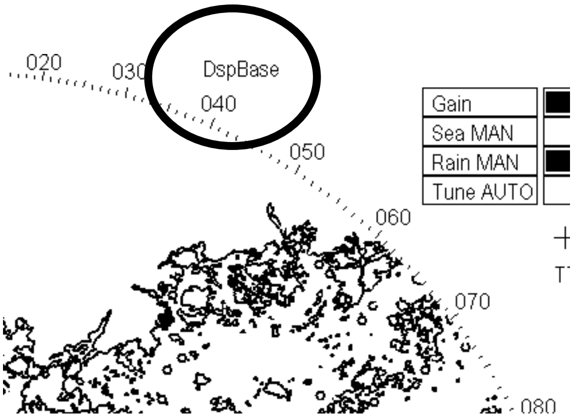
# 2.34 Chart Radar Functions

## 2.34.1 Chart DISP box

The Chart DISP box, which appears at the lower right-hand corner on the screen, functions to set chart display related settings. The box is always shown in the chart radar mode. You can show it in the ECDIS mode by selecting Chart Display from the menu. For details, see section 7.9.3 How to control visible chart features (chart display).

## 2.34.2 Chart database information

You can select what objects to display on the chart radar screen. There are four different pre-defined settings available. Indication of selected setting appears on the chart radar screen.



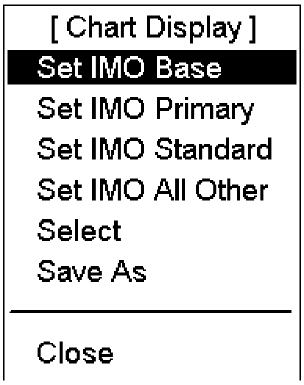

There are following predefined settings available:

- **IMO Base**, text indication **DspBase**. In Chart Display dialog nothing checked in Standard, Other 1 and Other 2 pages.
- **IMO Primary**, text indication **Primary**. In Chart Display dialog nothing else checked but "Buoys and Beacons" in Standard page.
  This is the "Primary Chart Information Set (PCIS)", based on IEC 62388 section11.1.4.1, IEC61174 and IMO Resolution A.817(19).
- **IMO Standard**, text indication **Std**. In Chart Display dialog all objects checked in standard page and nothing else Other 1 and Other 2 pages.
- **IMO All Other**, text indication **AllOther**. In Chart Display dialog everything checked in Standard, Other 1 and Other 2 pages.
- Text indication **Other**, if objects are checked any other way in Standard, Other 1 and Other 2 pages.

### *How to select pre defined chart database display settings*

To select desired IMO Chart Display Settings, proceed as follows:

1. Open the Chart Display dialog box and put the cursor on the black triangle on Chart Display dialog box then push the left mouse button.




2. Choose **Set IMO Base, Set IMO Primary, Set IMO Standard** or **Set IMO All Other** from the menu.

### *How to create user-defined chart database display settings*

See section 9.9.6 Storing and recalling chart display setting for visible chart and navigation features.

**Note 1:** We recommend that you create separate chart databases for "easy viewing of radar in chart radar mode" and "view chart details in ECDIS mode".

**Note 2:** Save chart radar mode settings and ECDIS mode settings together when creating a user-defined chart database.

**Note 3:** The chart database display settings that can be saved or selected are in the Standard, Other and Other 2 pages of the Chart Display dialog box.

**Note 4:** The items on the Chart page of the Chart Display dialog box are common to both the chart radar and ECDIS modes. However, the items cannot be saved or selected (on the Chart Display menu).

### 2.34.3 Temporary chart priority display control

The chart radar mode displays both the radar echo and chart symbols, with the radar echo having priority. If the chart symbols become hidden in the radar picture, do one of the following to give temporary priority to the chart symbols.

#### *Chart priority*

In the chart radar mode, select the Chart Priority box (bottom left-hand corner) and push and hold down the left mouse button to give priority to the chart symbols (coastline, depth contours, navigation buoys, etc.). Release the button to restore priority to the radar echo.

#### *Coast line only*

In the chart radar mode, select the Coast Line Only box (bottom left-hand corner) and hold down the left mouse button to temporarily erase chart symbols and show the coastline together with radar echo, which has priority. Release the button to show the chart symbols.

### 2.34.4 Chart status box

If, in the ECDIS mode, there is something wrong with a chart, a "permanent message for S57 charts" appears. For details see section 7.1.3 Permanent messages for S57 charts.

For the chart radar mode, a "permanent message" cannot be displayed automatically. In this mode, when something is wrong with a chart, the Chart Status box appears. Click the box to show the permanent message in the data display area.

### 2.34.5 Chart alert function

The chart alert function operates in both the chart radar mode and the ECDIS mode. There are two types of chart alerts: your ship's predicted course, and route alert. For details see Chapter 9 Chart Alerts.

For the ship's predicted course alert, the operator sets a safety contour (see section 9.1.1 How to select safety contour) to select safety depth suitable for the ship. The operator also sets the parameters for own ship predicted movement (see section 9.3 How to Activate Own Ship Check).

For the route alert, route planning (see section 9.4 Route Planning) and route monitoring (see section 9.5 Route Monitoring) functions are available.

Note that if you change from "chart radar" mode or "ECDIS" to "radar" mode, the chart alert feature is automatically switched off by the system.

# 3. Radar Observation

## 3.1 General

### 3.1.1 Minimum and maximum ranges

#### *Minimum range*

The minimum range is defined by the shortest distance at which, using a scale of 1.5 or 0.75 nm, a target having an echoing area of 10 $m^2$ is still shown separate from the point representing the antenna position.

It is mainly dependent on the pulse length, antenna height, and signal processing such as main bang reduction and digital quantization. It is a good practice to use a shorter range scale as far as it gives favorable definition or clarity of picture. The IMO Resolution MSC.192(79) requires the minimum range to be less than 40 m, respectively. This series of radars satisfy this requirement.

#### *Maximum range*

The maximum detecting range of the radar, Rmax, varies considerably depending on several factors such as the height of the antenna above the waterline, the height of the target above the sea, the size, shape and material of the target, and the atmospheric conditions.

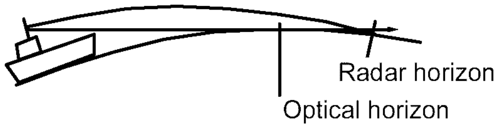
Under normal atmospheric conditions, the maximum range is equal to the radar horizon or a little shorter. The radar horizon is longer than the optical one by about 6% because of the diffraction property of the radar signal. The Rmax is given in the following equation.

$$R_{max} = 2.2 \times (\sqrt{h1} + \sqrt{h2})$$

where Rmax: radar horizon (nautical miles)

h1:antenna height (m)

h2 : target height (m)




For example, if the height of the antenna above the waterline is 9 meters and the height of the target is 16 meters, the maximum radar range is;

$$R_{max} = 2.2 \times (\sqrt{9} + \sqrt{16}) = 2.2 \times (3 + 4) = 15.4 \text{ nm}$$

It should be noted that the detection range is reduced by precipitation (which absorbs the radar signal).

#### *X-band and S-band*

In fair weather, the equation on the previous page does not give a significant difference between X- and S-band radars. However, in heavy precipitation condition, an S-band radar would have better detection than an X-band radar.

#### *Radar resolution*

There are two important factors in radar resolution (discrimination): bearing resolution and range resolution.

#### *Bearing resolution*

Bearing resolution is the ability of the radar to display as separate pips the echoes received from two targets that are at the same range and close together. It is proportional to the antenna length and reciprocally proportional to the wavelength. The length of the antenna radiator should be selected for a bearing resolution better than 2.5° (IMO Resolution). This condition is normally satisfied with a radiator of 1.2 m (4 ft) or longer in the X-band. The S-band radar requires a radiator of about 12 feet (3.6 m) or longer.

### Range resolution

Range resolution is the ability to display as separate pips the echoes received from two targets that are on the same bearing and close to each other. This is determined by pulse length only. Practically, a 0.08 microsecond pulse offers the discrimination better than 40 m as do so with all FURUNO radars.

Test targets for determining the range and bearing resolution are radar reflectors having an echoing area of 10 $m^2$.

### Bearing accuracy

One of the most important features of the radar is how accurately the bearing of a target can be measured. The accuracy of bearing measurement basically depends on the narrowness of the radar beam. However, the bearing is usually taken relative to the ship's heading, and thus, proper adjustment of the heading line at installation is an important factor in ensuring bearing accuracy. To minimize error when measuring the bearing of a target, put the target echo at the extreme position on the screen by selecting a suitable range.

### Range measurement

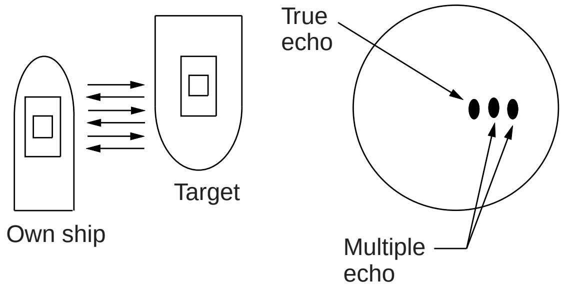
Measurement of the range to a target is also a very important function of the radar. Generally, there are two means of measuring range: the fixed range rings and the variable range marker (VRM). The fixed range rings appear on the screen with a predetermined interval and provide a rough estimate of the range to a target. The variable range marker's diameter is increased or decreased so that the marker touches the inner edge of the target, allowing the operator to obtain more accurate range measurements.

## 3.2 False Echoes

Occasionally echo signals appear on the screen at positions where there is no target or disappear even if there are targets. They are, however, recognized if you understand the reason why they are displayed. Typical false echoes are shown below.

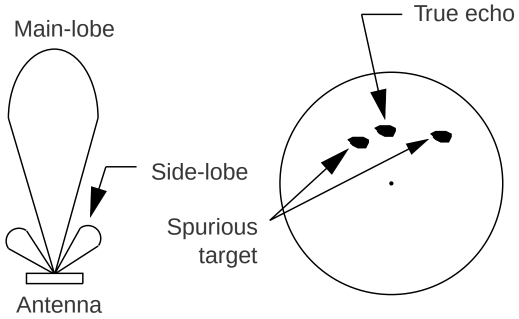
**Multiple echoes**

Multiple echoes occur when a transmitted pulse returns from a solid object like a large ship, bridge, or breakwater. A second, a third or more echoes may be observed on the display at double, triple or other multiples of the actual range of the target as shown below. Multiple reflection echoes can be reduced and often removed by decreasing the gain (sensitivity) or properly adjusting the A/C SEA control.



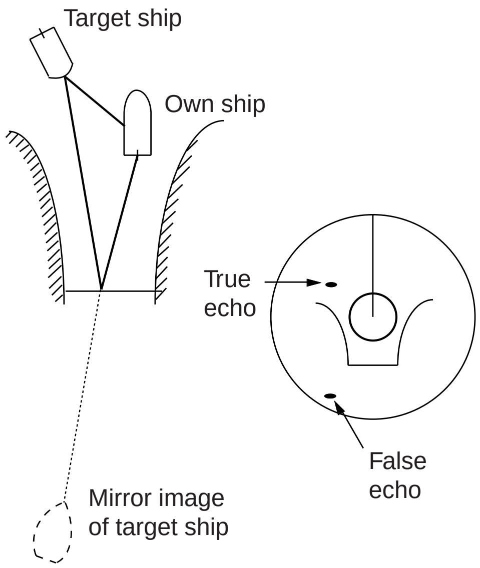

**Sidelobe echoes**

Every time the radar pulse is transmitted, some radiation escapes on each side of the beam, called sidelobes. If a target exists where it can be detected by the side lobes as well as the main lobe, the side echoes may be represented on both sides of the true echo at the same range. Side lobes show usually only on short ranges and from strong targets. They can be reduced through careful reduction of the gain or proper adjustment of the A/C SEA control.



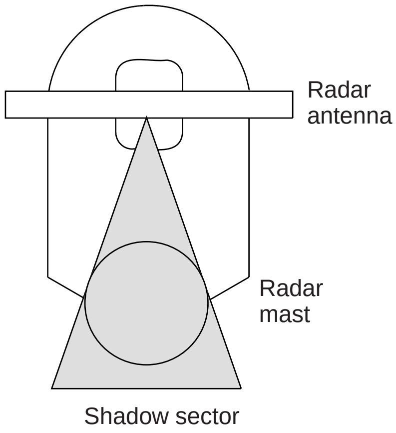

**Virtual image**

A relatively large target close to your ship may be represented at two positions on the screen. One of them is the true echo directly reflected by the target and the other is a false echo that is caused by the mirror effect of a large object on or close to your ship as shown in the figure below. If your ship comes close to a large metal bridge, for example.




**Shadow sectors**

Funnels, stacks, masts, or derricks in the path of the antenna block the radar beam. If the angle subtended at the antenna is more than a few degrees, a non-detecting sector may be produced. Within this sector targets can not be detected.

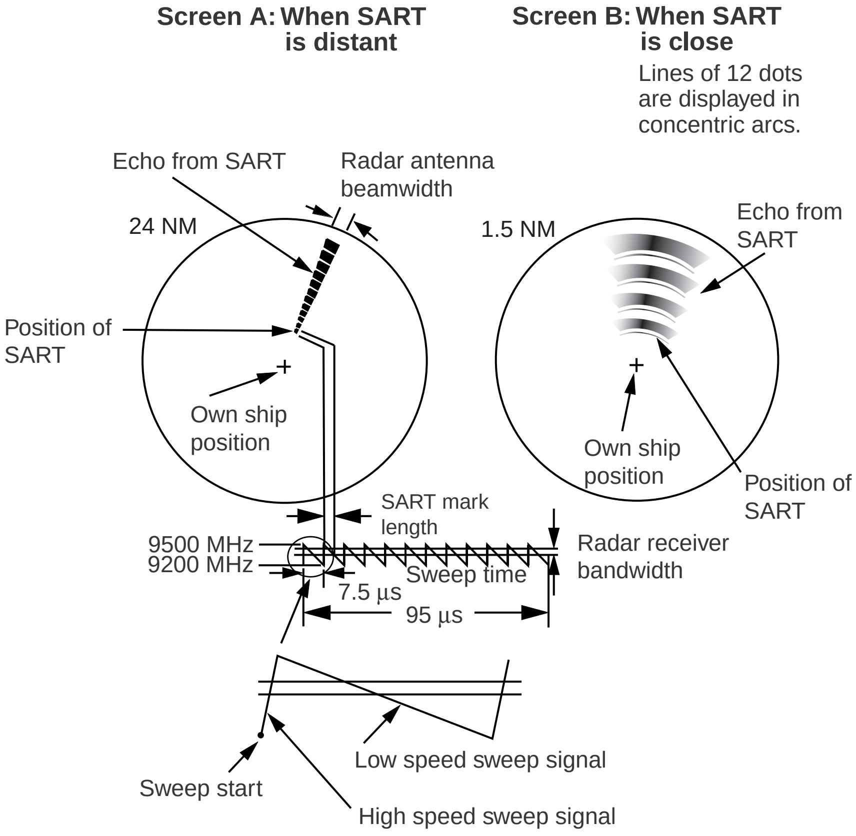


# 3.3 SART (Search and Rescue Transponder)

## 3.3.1 SART description

A Search and Rescue Transponder (SART) may be triggered by any X-Band (3 cm) radar within a range of approximately 8 nm. Each radar pulse received causes it to transmit a response that is swept repetitively across the complete radar frequency band. When interrogated, it first sweeps rapidly (0.4 µs) through the band before beginning a relatively slow sweep (7.5 µs) through the band back to the starting frequency. This process is repeated for a total of twelve complete cycles. At some point in each sweep, the SART frequency will match that of the interrogating radar and be within the pass band of the radar receiver. If the SART is within range, the frequency match during each of the 12 slow sweeps will produce a response on the radar display, thus a line of 12 dots equally spaced by about 0.64 nautical miles will be shown.

When the radar to the SART is reduced to about 1 nm, the radar display my show also the 12 responses generated during the fast sweeps. These additional dot responses, which also are equally spaced by 0.64 nautical miles, will be interspersed with the original line of 12 dots. They will appear slightly weaker and smaller than the original dots.




*SART*

### 3.3.2 How to show SART marks on the radar display

This radar is equipped with a feature that optimally sets up the radar for SART detection. This feature automatically detunes the radar receiver out of its best tuning condition. This erases or weakens all normal radar echoes, but the SART marks are not erased because the SART response signal scans over all frequencies in the 9 GHz band. When the radar approaches the SART in operation, the SART marks will enlarge to large arcs, blurring a large part of the screen.

To set up for SART detection do the following:

1. Use the trackball to select the MENU box then push the left button.
2. Spin the scrollwheel to select Echo then push the left button.

   [Echo]
   **Go Back**
   2nd Echo Rej
   PM
   SART
   Tune Initialize

   *Echo menu*

3. Spin the scrollwheel to select SART then push the scrollwheel. Check to set up for SART, uncheck for normal operation.
4. With SART turned on, radar functions are automatically set as follows:
   Range: 12 nm
   Pulse Length: Long
   Echo Stretch: Off
   Noise Rejector: Off
   Echo Averaging: Off
   Interference Rejector: Off
   Performance Monitor: Off
   A/C Rain:Off

"SART" appears when this feature is active. Be sure to turn off the SART feature when SART detection is no longer your objective.

### 3.3.3 General remarks on receiving SART

#### *SART range errors*

When responses from only the 12 low frequency sweeps are visible (when the SART is at a range greater than about 1 nm), the position at which the first dot is displayed may be as much as 0.64 nm beyond the true position of the SART. When the range closes so that the fast sweep responses are seen also, the first of these will be no more than 150 meters beyond the true position.

#### *Radar bandwidth*

This is normally matched to the radar pulse length and is usually switched with the range scale and the associated pulse length. Narrow bandwidths of 3-5 MHz are used with long pulses on long range scales and wide bandwidths of 10-25 MHz with short pulses on short ranges.

A radar bandwidth of less than 5 MHz will attenuate the SART signal slightly, so it is preferable to use a medium bandwidth to ensure optimum detection of the SART.

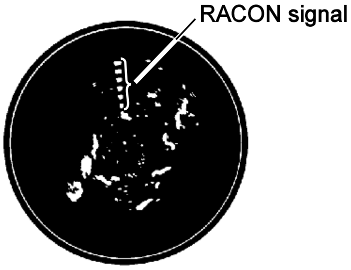
#### *Radar side lobes*

As the SART is approached, side lobes from the radar antenna may show the SART responses as a series of arcs or concentric rings. These can be removed by the use of the anti-clutter sea control although it may be operationally useful to observe the side lobes as they may be easier to detect in clutter conditions and also they will confirm that the SART is near to own ship.

**Note:** SART information excerpted from IMO SN/Circ 197 OPERATION OF MARINE RADAR FOR SART DETECTION.

## 3.4 RACON

A RACON is a radar beacon that emits radar-receivable signals in the radar frequency spectrum (X- or S-band). There are several signal formats. The most common one is a rectangular echo, originating at a point just beyond the position of the radar beacon. A RACON has a Morse coded pattern. Note that the position on the radar display is not accurate.




*RACON marks on the radar display*

## 3.5 Radar Target Enhancer (RTE)

An RTE is a radar transponder that is mounted on navigation buoys and masts of small crafts to significantly improve their detection by radar. Unlike a SART or RACON, which are passive, the RTE receives a radar signal, amplifies it and re-transmits it, with the intention of making the target's signal look larger on a radar display. The RTE is available in X-band and S-band types.

# 4. Tracked Target (TT) Operation

## 4.1 Usage Precautions

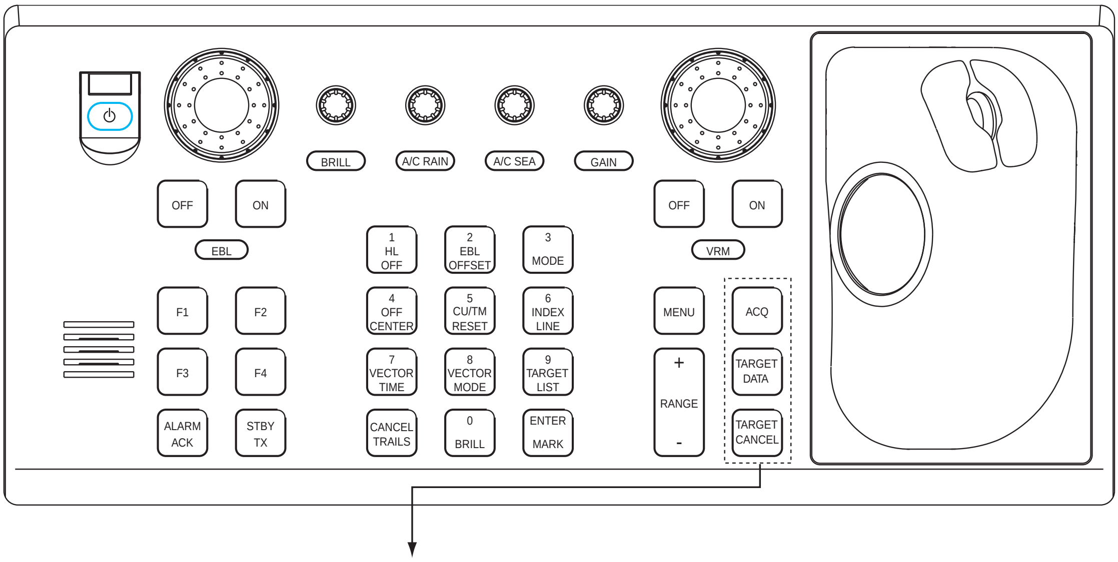
- This TT function meets the IMO requirements for the TT.
- For sake of brevity, this manual uses "TT" when referring to Tracked Target.
- Tracking accuracy is affected by the following:
    - Tracking accuracy is affected by course change. One to two minutes is needed to restore vectors to full accuracy after an abrupt course change. (The actual amount depends on gyrocompass specifications.)
    - The amount of tracking delay is inversely proportional to the relative speed of the target. Delay is on the order of 15-30 seconds for high relative speed; 30-60 seconds for low relative speed.
- The data generated by this TT are intended for reference only.

A target measuring 800 m or more in the radial or circumferential direction is regarded as a landmass and not acquired or tracked. Echoes smaller than 800 m are regarded as targets to be tracked.

## 4.2 Controls for TT

### *Keyboard*

The TT uses the keys shown below.




ACQ: Manually acquires a target.
TARGET DATA: Displays data on TT selected with trackball.
TARGET CANCEL: Terminates tracking of TT selected with trackball.

*Control unit RCU-020*

### *Trackball*

With the cursor inside the effective display area, you can access TT functions by spinning the scrollwheel or choosing appropriate TT function from the CURSOR menu.

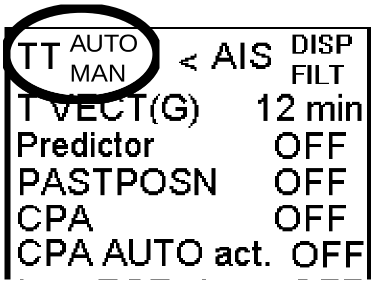
Spin the scrollwheel to show the following indications in the guidance area to access respective TT function:

Tgt Acquire: Manually acquires a target.

Tgt Cancel /L = All: Cancels tracking on cursor-selected TT.

## 4.3 How to Show, Hide TTs

To show or hide the TT display, use the trackball to select the TT setting at the right side of the display. Push the left mouse button to show AUTO MAN (activate) or OFF (deactivate) as desired.



# 4.4 How to Input Your Ship's Speed

The TT requires own ship's speed and heading data. The speed can be STW, BT, SOG, or echo-referenced speed (based on 3 max. stationary objects). Manual input is also possible.

For automatic or manual input, see section 2.5 How to Input Your Ship's Speed. For echo-referenced speed input follow the procedure below.

## 4.4.1 Echo-referenced speed input

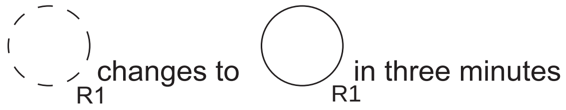
The use of echo-referenced speed is recommended when:

- The speed log is not operating properly or not connected to the radar.
- The vessel has no device that can measure ship's leeward movement (Doppler sonar, speed log, etc.) when leeward movement cannot be disregarded.

If you select echo-referenced speed, the TT calculates own ship's speed relative to a fixed reference target. The number of targets may be 1, 2 or 3. They appear as TTs, each denoted with a small circle. When a plural number of objects are selected, the mean value is used.

Note that this feature is not available when the AIS is active.

1. With the cursor inside the effective display area, spin the scrollwheel to display "Ref Mark" in the guidance area.
2. Select a small fixed island or any radar prominent point located at 0.1 to 24 nm from own ship.
3. Use the trackball to put the cursor (+) on the target selected at step 2.
4. Push the left button to enter the reference mark.




*Reference target*

5. Repeat steps 2-4 to continue entering reference marks. Three may be entered.

### *Notes on speed input by reference target*

- Reference targets are only used for the calculation of true speed.
- Do not use reference target generated true speed to calculate relative speed. Relative speed data is not accurate because response to speed change is slow, hampering the Tot's ability to accurately judge the possibility of collision.
- Select a stationary target as a reference target to calculate own ship speed as ground tracking speed. Do not choose a moving target as a reference target. A moving target produces error in the vector for TT and AIS, which results in wrong collision avoidance information. Further, an unstable stationary target produces inaccurate speed data and the target itself may become lost.
- When a reference target is lost or goes out of the acquisition range, that reference target mark blinks and the indication "TT Lost REF Target" appears in the Alert Box. If all reference targets are lost, the speed indication disappears. Select a different reference target if currently selected one is lost.
- When all targets are deleted, the reference target mark is also deleted and the target-based speed becomes invalid.
- Loss of reference target will affect the calculation of true speed and true course of targets. Further, own ship speed will be inaccurate.

### *Canceling echo-referenced speed input*

Open the SPD/CRS page, referring to see section 2.5 How to Input Your Ship's Speed, and check Manual Speed or Dual log as applicable.

# 4.5 Automatic Acquisition

This radar can acquire a maximum of 100 targets, the number of automatically and manually acquired targets determined by the TT TGT menu setting.

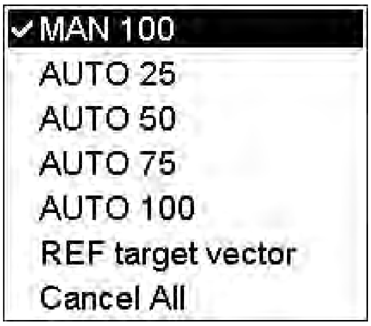
*TT TGT menu setting and target acquisition condition*

| Menu Setting | Acquisition condition |
|---|---|
| MAN100 | 100 targets manually |
| AUTO25 | 25 targets automatically, 75 targets manually |
| AUTO50 | 50 targets automatically, 50 targets manually |
| AUTO75 | 75 targets automatically, 25 targets manually |
| AUTO100 | 100 targets automatically |

A target just acquired automatically is marked with a broken circle and a vector appears within one minute to indicate the target's motion trend. Within three minutes, the initial tracking stage is finished and the target becomes ready for stable tracking. At this point, the broken circle changes to a solid circle.

## 4.5.1 How to enable auto acquisition

1. Use the trackball to select the TT ACQ mode box at the right side of the screen then push the right button to show the TT menu.




*TT menu*

2. Spin the scrollwheel to select automatic acquisition condition desired, referring to the table above for details, then push the scrollwheel.

**Note 1:** The TT ACQ mode box shows AUTO, AUTOMAN or MAN depending on the automatic acquisition condition selected.

**Note 2:** When the menu-set number of automatically acquired targets is reached, the message "TT AUTO ACQ 100% full" is displayed at the right-hand side of screen.

**Note 3:** Targets cannot be acquired manually using acquisition condition "AUTO 100". Also, you cannot acquire targets automatically in acquisition condition "MAN 100".

### 4.5.2 How to terminate tracking of targets (including reference targets)

When the TT has acquired the menu-set number of targets automatically, the message "TT AUTO ACQ 100% full" (or "TT MAN ACQ 100% full") appears at the right side of the screen and no more auto acquisition occurs unless targets are lost or manually cancelled. Should this happen, cancel tracking of less important targets or perform manual acquisition.

#### *How to cancel individual TTs*

**From the control unit w/keyboard**

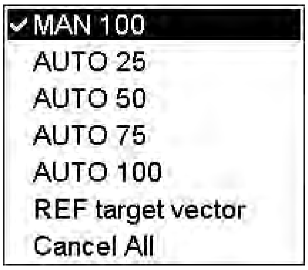
1. Use the trackball to put the cursor (+) on the TT or reference target to cancel tracking.
2. Push the **TARGET CANCEL** key.

**By trackball**

1. With the cursor inside the effective display area, spin the scrollwheel to show Tgt Cancel /L = All in the guidance area.
2. Use the trackball to put the cursor on the TT or reference target to cancel tracking.
3. Push the right button to cancel tracking on the target selected.

#### *How to cancel tracking on all TTs*

1. Use the trackball to select the TT ACQ mode box at the right side of the screen then push the right button.




*TT TARGET menu*

2. Use the scrollwheel to select Cancel All.
3. Push the scrollwheel to cancel tracking on all TTs.

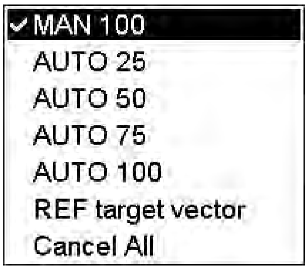
## 4.6 Manual Acquisition

Maximum 100 targets may be acquired manually depending on the acquisition condition set on the TT TGT menu.

**Note:** Targets cannot be acquired manually using acquisition condition "Auto 100". Also, you cannot acquire targets automatically in acquisition condition "Manual 100".

### 4.6.1 How to set manual acquisition conditions

1. Use the trackball to select the TT ACQ mode box at the right side of the screen then push the right button to show the TT TARGET menu.




*TT TARGET menu*

2. Spin the scrollwheel to select MAN 100, AUTO 25, AUTO 50 or AUTO 75 as appropriate then push the scrollwheel.

### 4.6.2 How to manually acquire a target

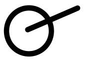
***From the control unit w/keyboard***

1. Use the trackball to put the cursor on the target you want to acquire.
2. Push the **ACQ** key.

***By trackball***

1. With the cursor inside the effective display area, spin the scrollwheel to show "Tgt Acquire" in the guidance area.
2. Use the trackball to put the cursor on the target you want to acquire.
3. Push the left button to acquire the target.

The plotting symbol is drawn by broken lines during the initial acquisition stage. A vector appears in about one minute after acquisition indicating the target's motion trend. If the target is consistently detected for three minutes, the plotting symbol changes to a solid circle. If acquisition fails, the target symbol blinks.

| TT Symbol | Meaning |
|---|---|
| | Immediately after acquisition, this plotting symbol is shown in broken lines. |
| | Within one minute after acquisition, a vector appears to show a trend of movement. |
|  | Within three minutes after acquisition, the plotting symbol changes to a small circle, indicating steady-state tracking condition. |

**Note 1:** For successful acquisition, the target to be acquired should be within 0.1 to 24 nm (or 32 nm, depending on initial setting) from own ship and not obscured by sea or rain clutter.

**Note 2:** When the capacity for manual acquisition is reached, the message "TT MAN ACQ 100% full" is displayed at the screen bottom. Cancel tracking of non-threatening targets if you wish to acquire additional targets manually.

⚠ **CAUTION**

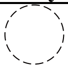
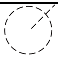
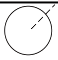
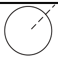
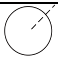
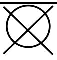
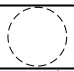
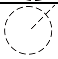
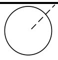
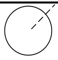
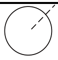
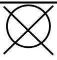
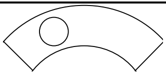
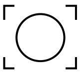
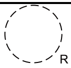
**Target Swap**

When a target being tracked nears another target being tracked, the targets may be "swapped". When two targets acquired either automatically or manually come close to each other, one of the two may become a Lost Target. Should this happen, manual re-acquisition of the Lost Target may be required after the two have separated.

# 4.7 TT Symbols and TT Symbol Attributes

## 4.7.1 TT symbols

The symbols used in this equipment comply with IEC 62388.

| Item | Symbol | Status | Remarks |
|---|---|---|---|
| Automatically acquired targets |  | Initial stage | Broken circle around an echo to indicate the target under acquisition and initial stage of tracking, before steady-state tracking. |
| |  | | Within one minute after acquisition (vector still unreliable). |
| |  | Steady tracking | Solid circle with vector indicating steady state tracking (within three minutes after acquisition). |
| |  (flashing) | CPA alarm | Plotting symbol (red) flashes to indicate the target is predicted to come into CPA or TCPA. |
| |  | CPA alarm acknowledge | Shown in red, and TT symbol disappears after CPA/TCPA alarm is acknowledged. |
| |  (flashing) | Lost target | A red X is crossed through the TT symbol to indicate that it is a lost target. Flashing stops after lost target alarm is acknowledged. |
| Manually acquired targets |  | Initial stage | Plotting symbol selected for a target acquired manually is shown in broken lines. |
| |  | | Within one minute after acquisition. |
| |  | Steady tracking | Manual plotting symbol in a solid circle (within three minutes after acquisition). |
| |  (flashing) | CPA alarm (collision course) | Plotting symbol (red) flashes to indicate the target is predicted to come into CPA or TCPA. |
| |  | | TT symbol disappears after CPA/TCPA alarm is acknowledged. |
| |  (flashing) | Lost target | A red X is superimposed on the TT symbol to indicate a lost target. Flashing stops after lost target alarm is acknowledged. See the next page for lost target criteria. |
| Acquisition zone |  (flashing) | On target passing through operator-set acquisition zone | Symbol is red and flashing. |
| Target selected for data readout |  | On selected target | Target data (range, bearing, course, speed, CPA and TCPA). |
| Reference target |  After acquisition, changes to "O" R | On reference target | Used to calculate own ship's over-the-ground speed (echo-referenced speed) for ground stabilization. |
| Trial maneuver | T (flashing) | Bottom center | Appears during execution of a trial maneuver. |
| TT performance test | S (flashing) | Bottom center | Appears during the TT performance test. |

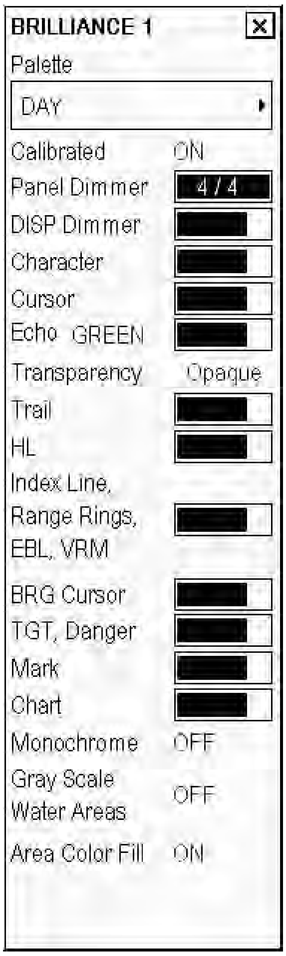
### *Lost target criteria*

Targets not detected in five consecutive scans become "lost targets." A lost target is shown in the display with a red X superimposed on the TT symbol. The TT symbol disappears after lost target alarm is acknowledged.

If you are in an area where TTs are lost frequently you may want to disable the lost target alarm against TTs by maximum range or minimum speed. See section 5.11.1 How to enable, disable audio alarm for lost target.

### 4.7.2 TT symbol brilliance

1. Use the trackball to select the BRILLIANCE box at the left side of the screen then push the right button.



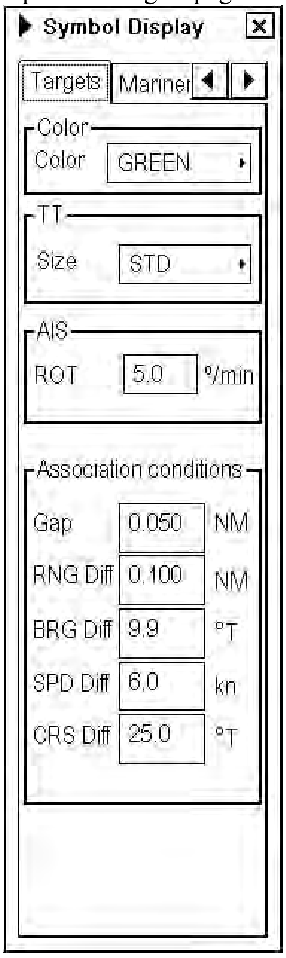

*BRILLIANCE menu*

2. Use the trackball to select TGT, Danger then spin the scrollwheel to adjust brilliance.
3. Click the Close window button (X) to close the menu.

### 4.7.3 Color and size for TT symbol

You can select the color and size of the TT symbol as follows:

1. Use the trackball to select the Symb DISP box at the right side of the screen then push the left button.
2. Open the Targets page.




*Symbol display dialog box, targets page*

3. Select the Color box.
4. Spin the scrollwheel to select color desired then push the scrollwheel.
5. Select the Size box.
6. Spin the scrollwheel to select SMALL or STD(Standard) then push the scrollwheel.
7. Click the Close window button (X) to close the menu.

# 4.8 How to Display TT Data

## 4.8.1 How to display target data for individual TT

### *By keyboard*

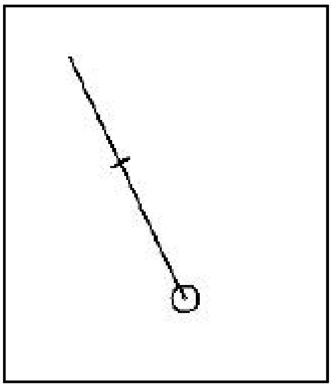
Use the trackball to put the cursor on a desired TT then push the **TARGET DATA** key.

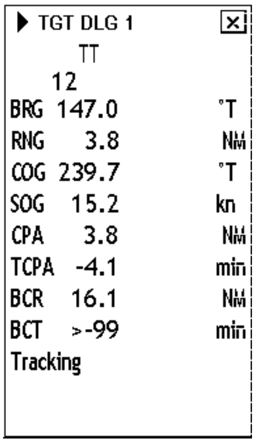
### *By trackball*

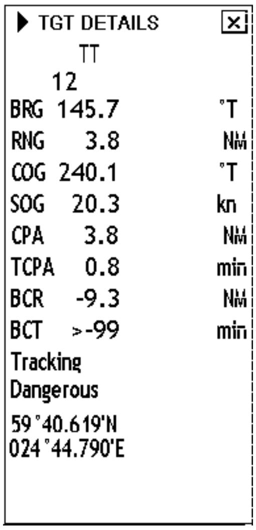
To erase data from the data box, choose target for which to erase its data then push the scrollwheel.

The basic target display dialog box for a TT consists of the following information:

- Target's number. Target numbering starts from "1". When a target is erased the number will not be reused until the power is re-set or more than 100 targets are acquired.
- Bearing (BRG) and distance (RNG) of the target from own ship
- True speed (SOG) and true course (COG) of the target
- CPA and TCPA. A negative TCPA value means that you have already passed the closest point and the TT is going away from own ship.
- Bow Closest Range (BCR) and Bow Closest Time (BCT)






*TT on chart radar screen* *TT display window* *TT display with details*

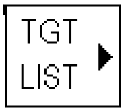
The detailed target display dialog box for a TT displays the contents of the basic TT display plus the following information. To display detailed information, put the cursor on the data display then push the left button.

- Target status can be Query, Tracking, Lost, Dangerous. "Query" indicates a new target for which there is not yet enough tracking history to have target speed, course, CPA and TCPA available.
- Position of target (Lat, Lon)

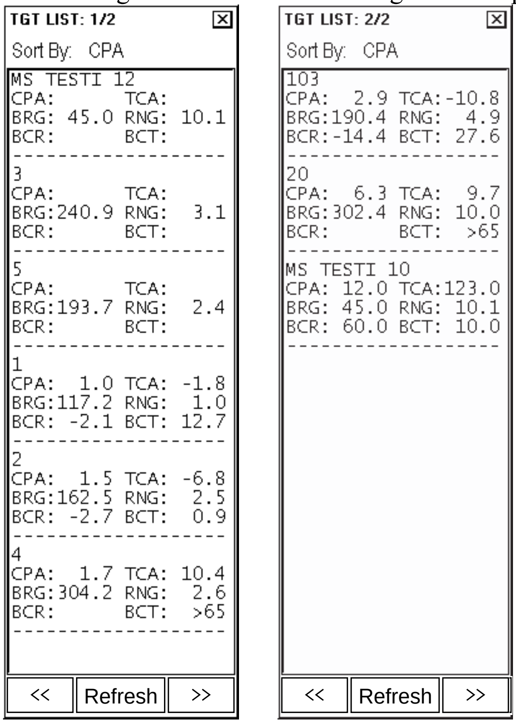
## 4.8.2 How to display individual TT data

### *By trackball*

1. Put the cursor in the TGT LIST box at the right side of the screen.




2. Push the right button to show the target data display.




3. If there is more than one page of data, use << or >> to scroll the list.
4. The Refresh button updates data.
5. Click the Close window button (X) to close the list, or wait 30 seconds for the window to close automatically.

### *How to sort the TT list*

You can sort the target list by CPA, TCPA, BCR, BCT, RANGE, TITLE or SPEED as follows:

1. Select "Sort By" from the target list, spin the scrollwheel to select sorting method desired then push the scrollwheel.
2. Click the Close window button (X) to close the list.

# 4.9 Vector Modes

Target vectors can be displayed relative to own ship's heading (Relative) or north (True).

## 4.9.1 Description of vectors

### *Ground stabilization and sea stabilization*

Target vectors can be ground stabilized or sea stabilized in the True Motion mode. You can select ground or sea stabilization from the speed selection dialog box. Select BT(Bottom Tracking) for ground stabilization or WT(Water Tracking) for sea stabilization. The TT VECTOR box shows the stabilization mode in the true motion as T VECT(G) or T VECT(S).

Sea stabilization is a mode where own ship and all targets are referenced to the sea using a compass heading and single-axis log water speed inputs in the true motion mode. Ground stabilization is a mode where own ship and all targets are referenced to the ground using the ground track or set and drift inputs. If the accuracy seems unsatisfactory, enter set and drift corrections. Note that set and drift should not be used when the radar is displaying AIS targets.

### *True vector*

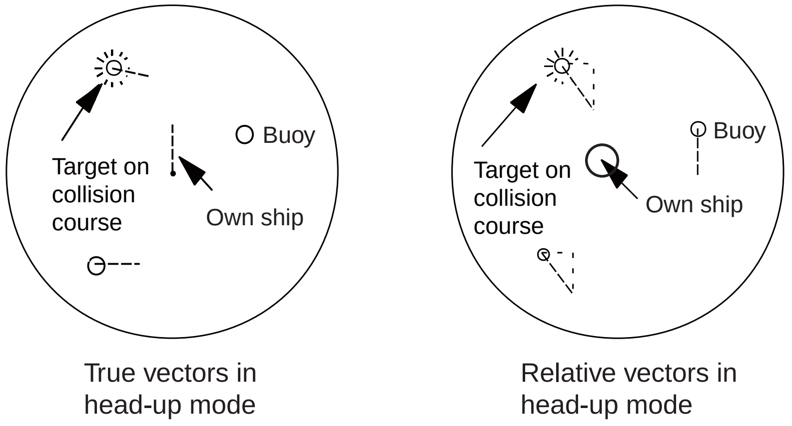
In the true motion mode, all fixed targets such as land, navigational marks and ships at anchor remain stationary on the radar screen with vector length zero. But in the presence of wind and/or current, the vectors appear on fixed targets representing the reciprocal of set and drift affecting own ship unless set and drift values are properly entered.

In the true vector mode, there are two types of stabilization: ground stabilization (T VECT(G)) and sea stabilization (T VECT(S)). The stabilization mode is automatically selected according to speed selection, as shown in the table below. For speed selection, see section 2.5 How to Input Your Ship's Speed.

| Speed selection | True vector mode |
|---|---|
| LOG(WT) | T VECT(S) |
| LOG(BT) | T VECT(G) |
| POSN | T VECT(G) |
| REF | T VECT(G) |
| MAN | T VECT(S) |
| MAN w/set & drift | T VECT(G) |

### *Relative vector*

Relative vectors on targets that are not moving over the ground such as land, navigational marks and ships at anchor will represent the reciprocal of own ship's ground track. A target whose vector passes through own ship is on a collision course. (Dotted lines in the figure are for explanation only.)




*True and relative vectors*

### 4.9.2 Vector motion and length

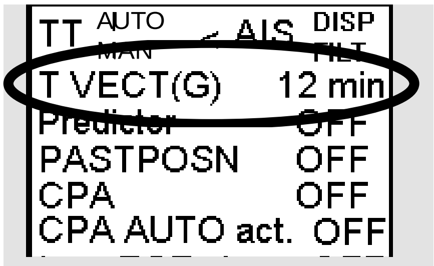
Vectors may be displayed in true or relative motion. Vector time (or the length of vectors) can be set between 30 seconds and 60 minutes.

#### *From the control unit w/keyboard*

1. Push the **VECTOR MODE** key consecutively to select relative or true vector mode. Your selection is shown in the Vector motion box. (Note that this also selects the vector mode for the past position display.)
2. Push the **VECTOR TIME** key. Your selection appears in the vector length box (see the illustration below).

#### *By trackball*

1. Use the trackball to select relative or true mode at the right side of the screen.




*TT VECTOR box*

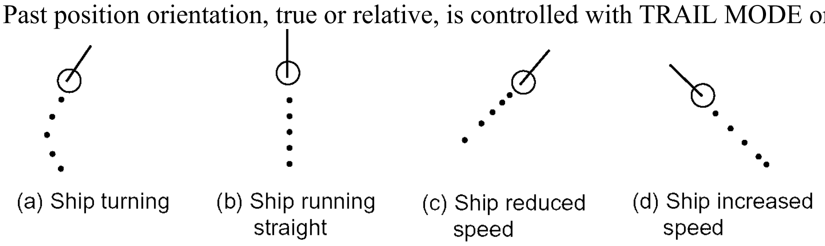
2. Spin the scrollwheel to display R VECT or T VECT as appropriate.
3. Use the trackball to select the vector time setting.
4. Spin the scrollwheel to display time desired.
5. Push the scrollwheel to confirm setting.

# 4.10 Past Position Display

The past position display shows equally time-spaced dots marking the past positions of any targets being tracked.

If a target changes its speed, the spacing will be uneven. If it changes the course, its plotted course will not be a straight line. See the illustration below for dot pattern and ship status.

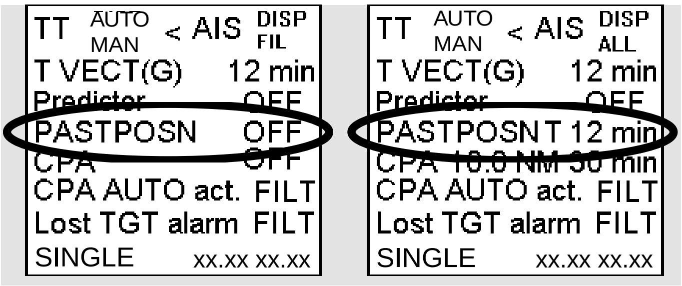
Past position orientation, true or relative, is controlled with TRAIL MODE on the TRAIL menu.




*Past position display*

## 4.10.1 Displaying and erasing past position points, choosing past position plot interval

1. Use the trackball to select the Past Posn indication at the right side of the screen.




*Past Posn indication*

2. Do one of the following to select a vector time.

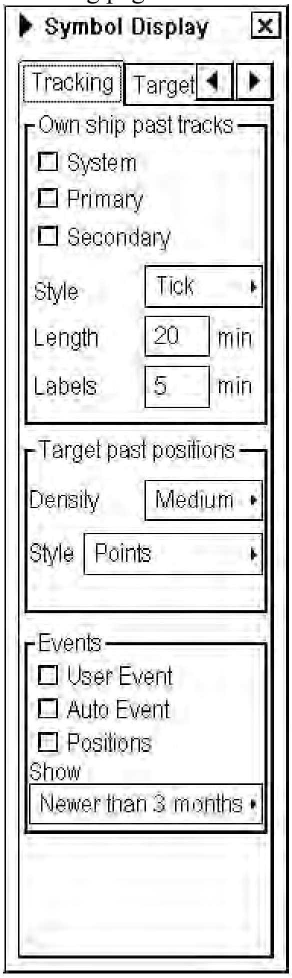
| Control | Available setting |
|---|---|
| Scrollwheel | 1, 2, 3, 5, 6, 10, 12, 15, 20, 30, 40, 50, 60 min |

The vector tip shows an estimated position of the target after the selected vector time elapses. It can be valuable to extend the vector length to evaluate the risk of collision with any target.

## 4.10.2 Past position display attributes

You can select the interval of past position points and style of past position points.

1. Use the trackball to select the Symb DISP box at the right side of the screen then push the left button. Select the Tracking page.



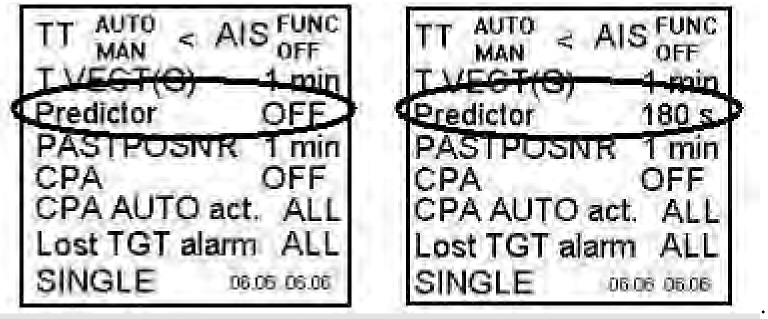

2. Select the Density box in the Target past positions window, spin the scrollwheel to select Sparse, Medium or Dense as appropriate then push the scrollwheel.
3. Select the Style box, spin the scrollwheel to select Points or Points and dots as appropriate then push the scrollwheel.
4. Click the Close window button (X) at the upper right corner to close the menu.

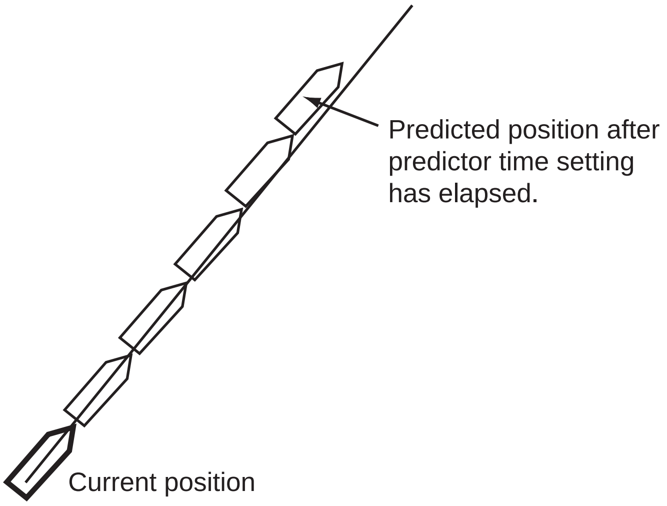
# 4.11 Predictor

The Predictor, shown in the sidebar, can be used to estimate own ship position in the future (30-180 seconds). To show the Predictor on the display, own ship symbol must be as "true scale symbol". The Predictor is displayed using five own ship symbols ahead in yellow color.

## 4.11.1 Predictor settings

Put the cursor on the text "Predictor" in the sidebar then use left mouse button to toggle the predictor ON/OFF. The current setting is shown in the mouse functions area. To set the time for the predictor, put the cursor on the time indication next to Predictor, spin the scrollwheel to choose a time then push the scrollwheel. The time from current position to the last of the predicted position may be chosen between 30 and 180 seconds, in 30-second intervals. The on-screen Predictor graphic consists of five pieces of your ships drawn in true scale to successive future positions.



## 4.12 Set and Drift

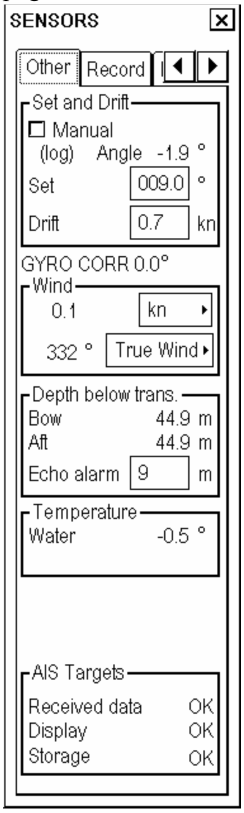
Set, the direction in which a water current flows. The value can be manually entered in 0.1-degree steps. Drift, in another word Rate, the speed of a tide, can also be entered manually in 0.1-knot steps.

Set and drift corrections are beneficial for increasing the accuracy of vectors and target data. Refer to the tide table on board the ship for setting information. These values are applied to all targets. If stationary targets have vectors, set and drift values should be adjusted until they lose vectors.

**Note:** Set and drift can be entered manually only if no positioning sensor is selected for use. Otherwise, the system calculates set and drift automatically.

To enter set and drift manually, do the following:

1. Put the cursor on the Position field in the information area
2. Push the right button. Left-click the arrows at top right corner of the SENSORS dialog box to select the Others page.




1. Check the Manual box in the Set and Drift window. Close the SENSORS dialog box.
2. Use the trackball to select the SET box at the right side of the screen.

*SET box*

3. Use the scrollwheel to set value, spinning it to select numeral then pushing it to set.
(Setting range: 000.0 – 359.9 (°T))
4. Use the trackball to select the DRIFT box at the right side of the screen.

*DRIFT box*

5. Use the scrollwheel to set value, spinning it to select numeral then pushing it to set.
(Setting range: 00.0 – 99.9(kn))

**Note:** Set and drift should be checked periodically for correctness.

# 4.13 Dangerous Target (CPA, TCPA)

The TT continuously monitors the predicted range at the Closest Point of Approach (CPA) and predicted time to CPA (TCPA) of each TT. When the predicted CPA of any TT becomes smaller than a preset CPA range and its predicted TCPA less than a preset TCPA limit, the audio alarm sounds and "TT dangerous target" appears (in red) in the Alert Box. In addition, the symbol of the offending TT is red and flashes together with its vector.

This feature, when used correctly, helps prevent the risk of collision by alerting you to threatening targets. It is important that GAIN, A/C SEA, A/C RAIN and other radar controls are properly adjusted.

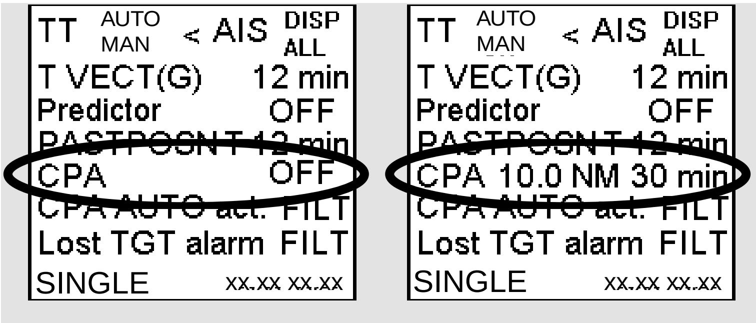
CPA and TCPA settings must be set up properly taking into consideration the size, tonnage, speed, turning performance and other characteristics of own ship.

> ⚠ **CAUTION**
>
> **CPA/TCPA Alarm**
>
> **The CPA and TCPA alarm feature should never be relied upon as the sole means for detecting risk of collision. The navigator is not relieved of the responsibility to keep visual lookout for avoiding collisions, whether or not the radar or other navigation aid is in use.**

## 4.13.1 How to set CPA and TCPA ranges

To set the CPA and TCPA ranges, do the following:

1. Use the trackball to select "CPA" of "CPA Off" at the lower right corner. Push the left button to show the CPA and TCPA boxes.




*CPA and TCPA settings*

2. Spin the scrollwheel to select the CPA setting desired (0.1-20 NM) then push the scrollwheel.
3. Use the trackball to select the TCPA setting.
4. Spin the scrollwheel to select TCPA value desired (1-60 min) then push the scrollwheel.

### *How to acknowledge the TT dangerous target alarm*

The TT dangerous target alarm sounds when the CPA or TCPA of an target is within the set CPA/TCPA. To acknowledge and silence the alarm, push the **ALARM ACK** key on the keyboard, or select the ALARM ACK box with the trackball then push the left button.

The warning label "TT dangerous target" and the flashing of the plotting symbol and vector remain in the Alert Box until the dangerous situation is gone or you intentionally terminate tracking of the target.

# 4.14 How to Set an Acquisition Zone

The acquisition zone functions both to alert you targets in a specific area and acts as an automatic acquisition area when automatic target acquisition is active. Any targets entering the zone will be automatically acquired.

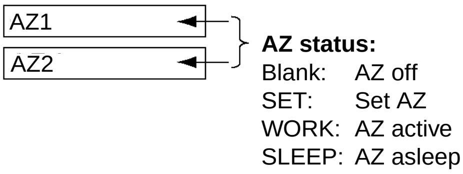
When a target enters an acquisition zone, the buzzer sounds and the indication TT target in ACQ ZONE (or AIS target in ACQ ZONE) appears (in yellow) in the Alert Box. The symbol of the offending target is red and flashing. Further, the AIS display is automatically turned on if it is off.

## 4.14.1 How to activate an acquisition zone

One or two acquisition zones may be set, and the maximum range for AZ1 is 6 nm and 24 nm for AZ2.

The procedure below shows how to set an acquisition zone, using the example at the bottom of the page.

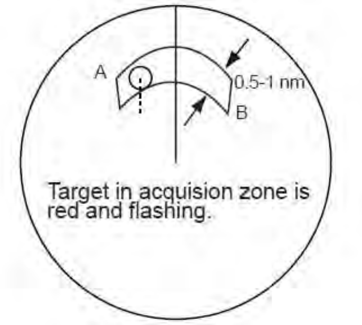
1. Use the trackball to select AZ1 box at the right side of the screen.




*AZ boxes*

2. Push the left button. The AZ box now reads "As SET."
3. Use the trackball to put the cursor on point A then push the left button.
4. Use the trackball to put the cursor on point B then push the left button.

The GZ box now reads "WORK."




*Acquisition zone*

**Note 1:** If you wish to create an acquisition zone having a 360-degree coverage around own ship, set point B in almost the same direction (approx. ±3°) as point A then push the left button.

**Note 2:** If the range scale is changed to less than half of the acquisition zone, the AZ box reads "OUT." If the left button is pushed in this state, the acquisition alarm zone goes into "sleep" state (inactive) and the guidance area reads "AZ WORK L = DELETE."

### 4.14.2 How to sleep, deactivate an acquisition zone

1. Use the trackball to select the appropriate AZ box.
2. Sleep or deactivate the acquisition zone as appropriate:
   **Sleep acquisition zone:** Push the left button momentarily to remove the acquisition zone from the screen. The indication in the AZ box changes from "WORK" to " SLEEP." To reactivate and display the acquisition zone, repeat this procedure to display "WORK."
   **Deactivate acquisition zone:** Push and hold down the left button until the AZ box goes blank.

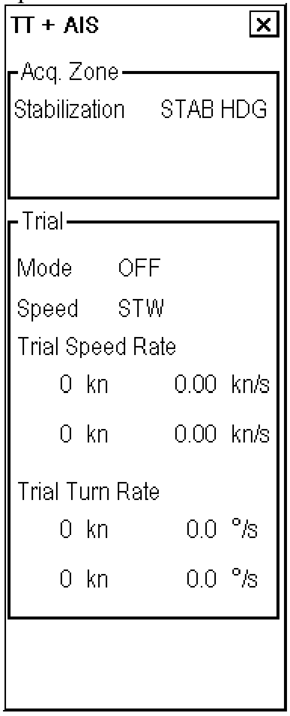
### 4.14.3 How to acknowledge the acquisition zone alarm

To acknowledge and silence the acquisition zone audio alarm, push the **ALARM ACK key**, or select the ALARM ACK box then push the left button.

### 4.14.4 Acquisition zone stabilization

The acquisition zone may be referenced to heading or North as follows:

1. Use the trackball to select the MENU box at the right side of the screen then push the left button.
2. Spin the scrollwheel to select TT+AIS then push the scrollwheel.



*TT+AIS menu*

3. In the Acquisition Zone window, select how to stabilize the acquisition zone, with heading or to North. Spin the scrollwheel to select Stab Hag or Stab N(orth) as appropriate then push the scrollwheel.
4. Click the Close window button (X) to close the menu.

## 4.15 TT Alerts

There are nine situations that cause the TT to trigger visual and audio alarms. To silence the audio alarm, push the **ALARM ACK** key, or select the ALARM ACK box then push the left button.

*TT alerts*

| Message no. | Message | Alert category | Description |
|---|---|---|---|
| 110 | TT dangerous target | Alarm | A TT is on collision course. |
| 111 | TT target in ACQ ZONE | Warning | TT has entered an acquisition zone. The target's symbol is red and flashing. |
| 112 | TT lost target | Warning | When the system detects a loss of a TT, a red X is superimposed on the target symbol and flashes. At the same time, an audible alarm is produced for one second. The lost target mark disappears from the screen after the lost target alarm is acknowledged. |
| 114 | TT AUTO ACQ 100% full | Warning | Appears when capacity for automatically acquired targets is full. |
| 115 | TT AUTO ACQ 95% full | Warning | Appears when capacity for automatically TTs is 95% full. |
| 116 | TT MAN ACQ 100% full | Warning | Appears when capacity for manually acquired targets is full. |
| 117 | TT MAN ACQ 95% full | Warning | Appears when capacity for manually TTs is 95% full. |
| 118 | TT System error | Warning | When the Main CPU receives no signal input from TT, the screen shows "TT System error" with an indication denoting offending equipment, also releasing an audible alarm. |
| 120 | TT lost REF target | Warning | When the system detects a loss of a reference target, a red X is superimposed on the target symbol and flashes. At the same time, an audible alarm is produced for one second. The reference target mark disappears from the screen after the reference target alarm is acknowledged. |

# 4.16 Trial Maneuver

The trial maneuver feature simulates the effect of own ship's movement against all TTs, without interrupting the updating of target information. It is available for use with the TT and AIS functions. For more accurate results, use relative motion and sea stabilization (ground tracking).

## 4.16.1 Types of trial maneuvers

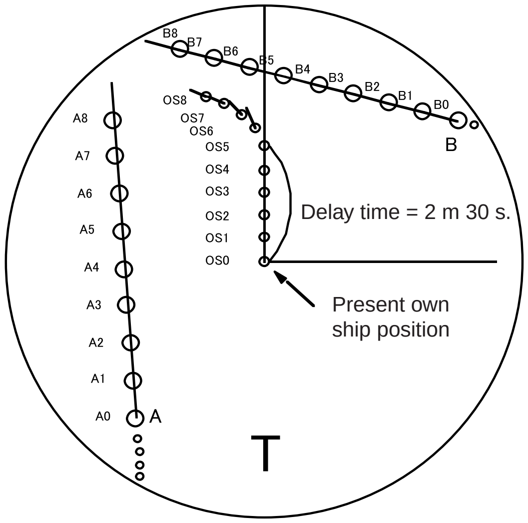
There are two types of trial maneuvers: static and dynamic.

### *Dynamic trial maneuver*

A dynamic trial maneuver displays predicted positions of the TTs and own ship. You enter own ship's intended speed and course with a certain "delay time." Assuming that all TTs maintain their present speeds and courses, the targets' and own ship's future movements are simulated in one-second increments indicating their predicted positions in 30-second intervals as illustrated below.

The delay time represents the time lag from the present time to the time when own ship will actually start to change her speed and/or course. You should therefore take into consideration own ship's maneuvering characteristics such as rudder delay, turning delay and acceleration delay. This is particularly important on large vessels. How much the delay is set the situation starts immediately and ends in a minute.

In the example shown below, own ship will advance straight ahead (even after a maneuver) for a delay time of 2:30 and alters speed and course until operator-specified intended speed and course are achieved (position OS7 in this example).

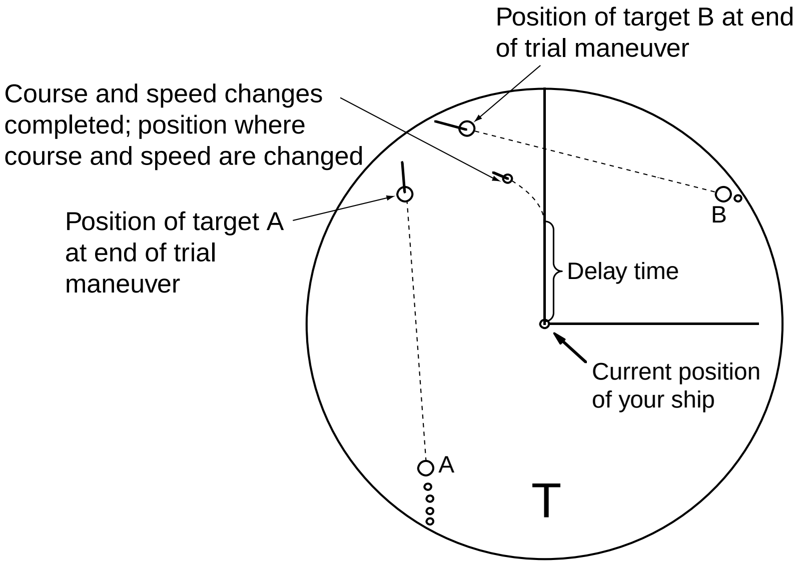



*Dynamic trial maneuver*

### *Static trial maneuver*

The static trial maneuver shows the relationship between your ship and TTs at the completion of the trial maneuver. Enter expected course and speed and delay time until start of a maneuver and the expected position of your ship and TTs at the end of the trial maneuver are shown on the display.

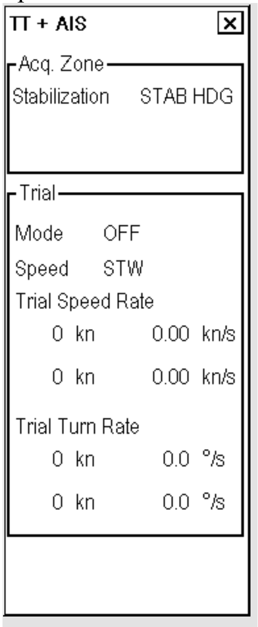
By shortening and extending the trial time you can find the safe time to make a maneuver. Thus, the static trial maneuver will be convenient when you wish to know the maneuver result immediately.




## 4.16.2 How to do a trial maneuver

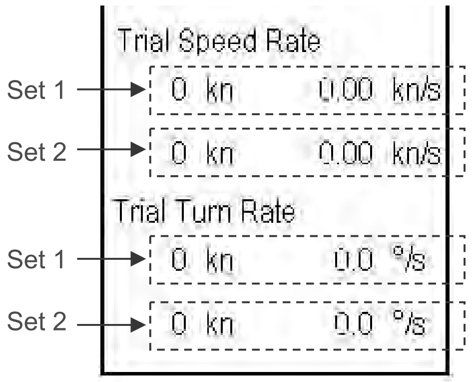
To perform a trial maneuver, do the following:

1. Use the trackball to select the MENU box at the right side of the screen then push the left button.
2. Spin the scrollwheel to select TT+AIS then push the scrollwheel.




*TT+AIS menu*

3. Select the setting of Mode in the Trial window, select Static or Dynamic as appropriate then push the scrollwheel.
4. Set trial speed rate with the scrollwheel: Spin the scrollwheel to select numeral; push the scrollwheel to set.
5. Set trial turn rate with the scrollwheel: Spin the scrollwheel to select numeral; push the scrollwheel to set. Two sets of trial speed and trial turn rate combinations are provided. Enter the data by sets as shown in the figure below. This is done to provide accurate trial maneuver results for various ship's speed.




Set speed and turn rate to zero (0) to simulate course and speed changes not affected by ship's inertia.

6. Click the Close window button (X) to close the menu. Then, the TRIAL box appears at the right side of the display.

TRIAL OFF

*TRIAL box*

7. Use the trackball to select the TRIAL box then push the scrollwheel to display TRIAL SET. Then, the TRIAL box reads TRIAL SET and boxes appear above the TRIAL box as below.

TRIAL 00:00 ← Trial time
DELAY 00:30 ← Delay time for trial maneuver
86.8°T ← Course for trial maneuver
06.5kn ← Speed for trial maneuver

*Boxes for setting trial maneuver parameters*

8. Use the scrollwheel to select delay time at DELAY. This is the time after which own ship takes a new situation, not the time the simulation begins. Change the delay time according to own ship loading condition, etc. Spin the scrollwheel to select numeric; push the scrollwheel to set.
9. Use the trackball to select the course-setting box. Use the scrollwheel to set the course: Spin the scrollwheel to select location; push the scrollwheel to set.
10. Use the trackball to select the speed-setting box. Use the scrollwheel to set the speed: Spin the scrollwheel to select location; push the scrollwheel to set.

    Note: **Course and speed may also be set with the EBL and VRM, respectively. Put the cursor in any one of the four trial maneuver related boxes and operate applicable control.**

11. Select TRIAL SET. Push the left button or the scrollwheel. The TRIAL box shows "TRAIL 00:00" (00:00 is trial maneuver time).

The time indication depends on trial mode:
**Dynamic mode:** The position of your ship and TTs is updated and displayed every 30 seconds.
**Static mode:** The position of your ship and TTs when set course and speed are reached are displayed. The progress time until the position is reached is indicated on the display. The trial time can be changed from the Trial Time box. Put the cursor in the Trial Time box and roll the scrollwheel. The position of targets at the end of selected time is shown. Increase or decrease the time to get a safe manuever. When the cursor is removed from the box the original positions of your ship and TTs are restored. If a manuever is unsafe, change speed, course and delay until it is safe.

The trial maneuver takes place with the letter "**T**" displayed at the bottom of the screen. The time appears at the top right side of the display. If any TT is predicted to be on a collision course with own ship (that is, the target ship comes within preset CPA/TCPA limits), the target plotting symbol flashes. If this happens, change own ship's trial speed, course or delay time to obtain a safe maneuver.

### *Terminating a trial maneuver*

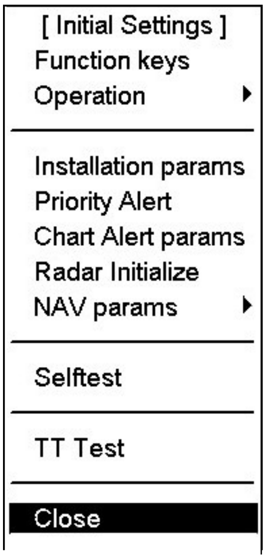
The termination depends on the trial mode as follows:
**Dynamic mode:** The trial is terminated when 60 minutes is shown in the Trial Time Box.
**Static mode:** The trial is terminated when you terminate the trial maneuver manually.

To terminate the trial maneuver manually, put the cursor in the Trial Time box then push the left button to show TRAIL OFF in the box.

## 4.17 TT Performance Test

A test program is provided for assessing overall performance of the TT. Normal operation is suspended and the indication "S" appears at the bottom of the effective display area during the test. The test may be terminated at any time.

1. Use the trackball to select the MENU box then push the left button.
2. Spin the scrollwheel to select Initial Settings then push the scrollwheel.
3. Use the trackball to select the small black triangle on the Initial Settings menu.

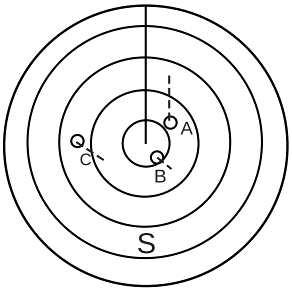



4. Spin the scrollwheel to select TT Test then push the scrollwheel.
5. "S" flickers during the test. It takes approximately three minutes for all vectors to be displayed. The test does not need echo signals, gyro nor speed log input. Three targets having different speeds and courses, as shown in the table below, are simulated automatically, together with current targets. These targets can be treated as you would an ordinary TT – you can cancel them, display their data, etc.
6. The test continues for ten minutes and repeats.

To terminate the test, push the **STBY TX** key or select the TX STBY box at the bottom left corner then push the left button.

Select any simulated target with the cursor and check that the selected target shows the course and speed as in the table. CPA and TCPA shown in the table are with ship’s speed of 0 kn. These values change with time and own ship's movement.

| | Range | Bearing | Speed | Course | CPA | TCPA |
|---|---|---|---|---|---|---|
| Target A | 3.0 | 45.0 | 20.0 | 0.0 | 2.1 | -6.4 |
| Target B | 2.0 | 120.0 | 5.0 | 120.0 | 0.0 | -24.0 |
| Target C | 7.0 | 270.0 | 100.0 | 120.0 | 3.5 | 3.5 |



# 4.18 Criteria for Selecting Targets for Tracking

The FURUNO TT video processor detects targets in midst of noise and discriminates radar echoes on the basis of their size. Target whose echo measurements are greater than those of the largest ship in range or tangential extent are usually land and are displayed only as normal radar video. All smaller ship-sized echoes that are less than this dimension are further analyzed and regarded as ships and displayed as small circles superimposed over the video echo.

When a target is first displayed, it is shown as having zero true speed but develops a course vector as more information is collected. In accordance with the International Marine Organization Automatic Radar Plotting Aid (IMO TT) requirements, an indication of the motion trend should be available within 20 scans of antenna and full vector accuracy within 60 scans. The FURUNO TTs comply with these requirements.

### *Acquisition and tracking*

A target that is hit by five consecutive radar pulses is detected as a radar echo. Manual acquisition is done by designating a detected echo with the trackball. Automatic acquisition is done in the acquisition areas when a target is detected 5-7 times continuously depending upon the congestion. Tracking is achieved when the target is clearly distinguishable on the display for 5 out of 10 consecutive scans, whether acquired automatically or manually. Required tracking facilities are available within 0.1-32 nm on range scales including 3, 6, 12 nm, full plotting information is available within one scan when the range scale has been changed.

Targets not detected in five consecutive scans become "lost targets."

### *Quantization*

The entire picture is converted to a digital from called "Quantized Video." A sweep range is divided into small segments and each range element is "1" if there is radar echo return above a threshold level, or "0" if there is no return.

The digital radar signal is then analyzed by a ship-sized echo discriminator. As the antenna scans, if there are five consecutive radar pulses with 1's indicating an echo presence at the exact same range, a target "start" is initiated. Since receiver noise is random, it is not three-bang correlated, and it is filtered out and not classified as an echo.

The same is true of radar interference. Electronic circuits track both the closet and most distant edges of the echo. At the end of the scanning of the echo, the discriminator indicates the measured maximum range extent and total angular extent subtended by the echo. If the echo is larger than a ship-sized echo in range extent and/or angular width, adjusted as a function of range, it is declared to be a coastline and the closet edge is put into memory as a map of the area. This land outline is used to inhibit further acquisition and tracking of ship-sized echoes beyond the closest coast outline. Five consecutive scans of coastal outline are retained in memory to allow for signal variation. All smaller echoes are declared to be ship sized and the middle of the leading edge is used to provide precise range and bearing coordinates of each echo on every scan. This range/bearing data is matched to previous data and analyzed from scan-to-scan for consistency. When it is determined to be as consistent as a real target, automatic acquisition occurs and tracking is initiated. Continued tracking and subsequent calculation develop the relative course and speed of the target.

The true course and speed of own ship are computed from own ship's gyro and speed inputs, and the resulting course and speed of each TT is easily computed by vector summing of the relative motion with own ship's course and speed. The resulting true or relative vector is displayed for each of the TTs. This process is updated continually for each target on every scan of the radar.

### *Qualitative description of tracking error*

The FURUNO TT's accuracy complies with or exceeds IMO standards.

#### Own ship maneuvers

For slow turns there is no effect. For very high turning rates (greater than 150°/minute, depending on gyro), there is some influence on all TTs that lasts for a minute or two then all TTs revert to full accuracy.

#### Other ship maneuvers

Target ship courses; lag 15 to 30 seconds at high relative speed, or 3 to 6 seconds at low (near 0) relative speed. It is less accurate during a turn due to lag, but accuracy recovers quickly.

## 4.19 Factors Affecting TT Functions

### *Sea returns*

If the radar anti-clutter control is adjusted properly, there is no serious effect because distant wave clutter, not eliminated by this control, is filtered out by more than one bang correlation and scan-to-scan matching of data.

### *Rain and snow*

Clutter can be acquired and tracked as targets. Adjust the A/C RAIN control. If it is heavy rain, switch to S-band if provided, or switch on the interference rejector on the radar. If heavy clutter still exists, switch to manual acquisition. Accuracy can be affected.

### *Low clouds*

Usually no affect. If necessary, adjust the A/C RAIN control.

### *Non-synchronous emissions*

No effect.

### *Low gain*

Insufficient or low radar receiver gain will result in some targets not being acquired at long distance. TT display will be missing on one or more targets that could only be visible if the radar sensitivity control (GAIN control) were increased.

The setting of the correct radar receiver gain is not critical but the target should be on the radar PPI and be clearly visible and well defined.

Manual acquisition is done if a target is positively displayed more than once. Automatic acquisition is done when the target is detected 5-7 times continuously. Tracking is achieved when the target is detected five times (not necessarily continuously) out of 10 scans. If not detected six times out of 10 scans, the target will become a "lost target." The TT will acquire a radar echo that is present once in every six antenna scans and continue tracking if 1 in 10.

### *Second trace echoes*

When the radar beam is super refracted, strong echoes may be received at such long ranges that they appear on a different timebase sweep than the transmitted pulse. This gives an incorrect range indication. Second and third trace echoes can be tracked if they are consistent enough to meet acquisition and tracking criteria but target course and speed data will be in error.

### *Blind and shadow sectors*

Radar shadow or blind areas caused by obstructions aboard ship, for example, funnels and masts, in the path of the radar beam can result in reduction of radar beam intensity in that particular direction. This may eliminate the detection of some targets. The TT system will lose track of targets shortly after they are lost on the radar picture and if they remain in a blind zone. These targets will however be acquired and tracked when they pass out of the blind zone and again present normal radar echo. The angular width and bearing of any shadow sector should be determined for their influence on the radar. In certain cases false echoes in the shadow sector cause the TT system to acquire, track, and vector them. Shadow sectors should be avoided.

### *Indirect echoes*

A target at close range is usually picked up directly, but it can also be received as reflection from a large, flat surface. This will result in the radar presenting two or more echoes on the display, each at a different range. The TT can acquire and track the false echo if it is detected by five consecutive scans. Reduction in radar gain can eliminate the multiple echoing but care should be taken as range detection also will be reduced.

### *Radar interference*

If interference is extreme due to another radar operating at close range, spiral "dotting" and/or false targets may appear momentarily. The interference rejector can clear the display.

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# 5. AIS Operation

An AIS transponder can be connected to the Chart Radar to display AIS targets received from the AIS transponder. The Chart Radar can store up to 1,500 AIS targets in its storage buffer. When this buffer becomes full of AIS targets, the Alert 639 is generated to alert you to full storage buffer. The storage buffer contains automatic dead reckoning for all AIS targets, which is based on reported Speed Over Ground (SOG), Course Over Ground (COG), Rate Of Turn (ROT) and heading. The storage buffer also contains calculation of range, bearing, CPA, TCPA, etc. The CPA and TCPA limits set for dangerous targets are common for TT and AIS targets.

The chart radar can display AIS targets that are within the operator-defined range (max. range is 48 nm). The maximum number of targets that can be displayed is 240 and the operator may choose the number of targets to display. Alert 637 is generated when there are more than the operator-specified amount of AIS targets within the operator-chosen range.

The frequency for update of AIS transponder-sent data depends on speed and course of tracked AIS target. The table below shows the IMO standardized reporting rates for the AIS transponder. Based on the table below, the chart radar defines which AIS targets are in tracking, lost or deleted. When you acknowledge a lost target alert, AIS symbol will be removed from the display. If lost target is not acknowledged, automatic removal of AIS symbol is done as shown table below.

| **Type of Ship** | **IMO nominal reporting interval** | **Lost target indication (reporting interval >)** | **Pre-set rate for automatic removal of lost target** |
|---|---|---|---|
| Class A: speed between 0-14 kn | 10 s | 50 s | 430 s |
| Class A: speed between 14-23 kn | 6 s | 30 s | 430 s |
| Class A: speed greater than 23 kn | 2 s | 10 s | 430 s |
| Class A: anchored, moored, not under control or grounded, speed between 0-3 kn | 3 min | 10 min | 36 min |
| Class A: anchored, moored, not under control or grounded, speed greater than 3 kn | 10 s | 50 s | 36 min |
| Class B: CS speed between 0-2 kn | 3 min | 10 min | 36 min |
| Class B: CS speed greater than 2 kn | 30 s | 150 s | 430 s |
| Class B: SOTDMA speed between 0-2 kn | 3 min | 10 min | 36 min |
| Class B: SOTDMA speed between 2-14 kn | 30 s | 150 s | 430 s |
| Class B: SOTDMA speed between 14-23 kn | 15 s | 75 s | 430 s |
| Class B: SOTDMA speed greater than 23 kn | 5 s | 25 s | 430 s |
| Class A and Class B: no speed available | N/A | 10 min | 36 min |
| ATON | 3 min | 10 min | 30 min |
| SAR | 10 s | 50 s | 430 s |
| Base station | 10 s | 50 s | 430 s |
| SART | N/A | 10 min | 30 min |

An AIS transponder "sees" all ships fitted with an AIS transponder belonging to either

- Class A AIS
- Class B AIS

Additionally the AIS transponder receives messages from ships and these non-ships:

- AIS Base station
- AIS on airborne SAR craft
- AIS on ATON (AIS aid to navigation)

There can be several hundreds or several thousands of AIS targets, and of those only a few will be significant for your ship. To remove unnecessary AIS targets from the Chart Radar display, the feature "active and sleeping AIS targets" is available. Initially any new AIS target received by an AIS transponder is not active (="sleeping"). Such non-active targets are shown with a small triangle. User can pick any AIS target and change it from non-active to

active. Active AIS targets are shown with a large triangle with speed vector, headline, rot indicator, etc. Further, the operator can pick active AIS targets and change their status to non-active.

An indication of AIS target display capacity limit is given well before it is reached. When 95% of user set limit is reached for displayed AIS targets, the alert "636 AIS display 95% full" appears. When user set limit is reached, the alert "637 AIS display 100% full" appears.

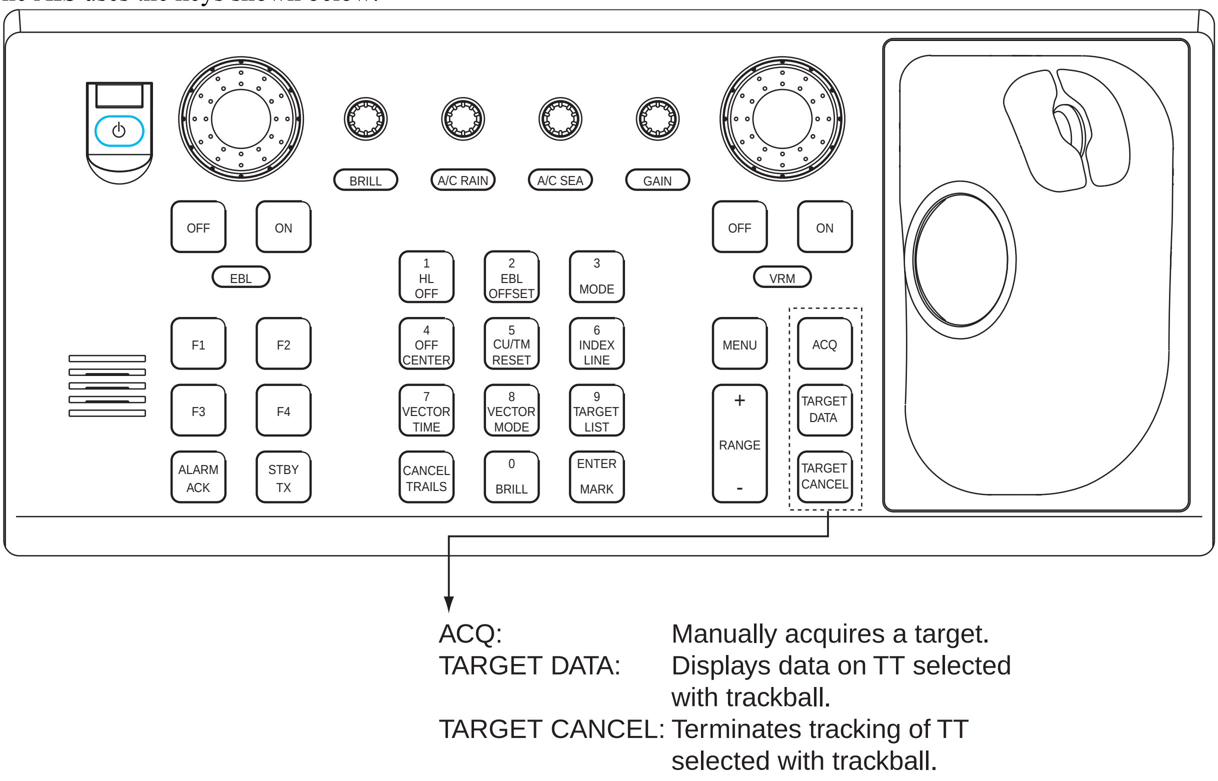
An indication of AIS target processing capacity limit is given well before it is reached. The alert "638 AIS storage 95% full" will be given when 95% of 1,500 targets are in storage buffer and the alert "639 AIS storage 100% full" will be given when 1,500 targets or more are in storage buffer.

Chart Radar generates AIS-related alerts and these are "Alert 632: AIS dangerous target" and "Alert 633: AIS lost target". Only active AIS targets generate alerts. The operator can enable or disable AIS target alerts as desired. The feature "active and sleeping AIS targets" is very effective for focusing on only those AIS targets that need supervision. The Chart Radar further eases the task of the operator by automatically changing non-active targets to active targets, if they meet the dangerous target limits set by CPA and TCPA.

# 5.1 Controls for AIS

### *Control unit*

The AIS uses the keys shown below.




*Control unit RCU-020*

### *Trackball*

With the cursor inside the effective display area, you can access AIS functions by spinning the scrollwheel or choosing appropriate AIS function from the CURSOR menu.

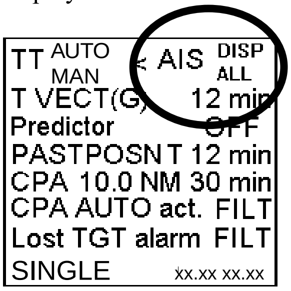
Spin the scrollwheel to show the following indications in the guidance area to access respective AIS function:

Tgt Acquire: Activates selected AIS target; displays target data for AIS target selected with the trackball.

Tgt Cancel /L = All: Sleeps selected AIS target.

## 5.2 How to Deactivate the AIS Function

Use the trackball to set the cursor on the AIS status indication in the information area. Long-push the left button to display FUNC OFF. To activate AIS, push the left button again.



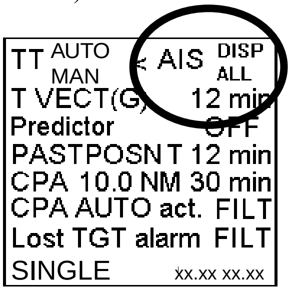

**Note:** You cannot enable AIS if any of the items listed below are active.

- Manual speed
- Manual set & drift
- Speed from reference targets

The message shown right appears if you try to activate the AIS function when the above-mentioned items are active.

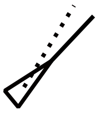
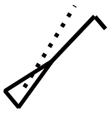
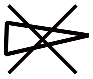
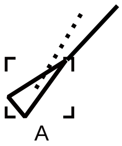
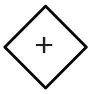
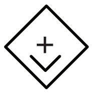
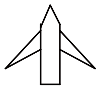
## 5.3 How to Turn the AIS Display On/Off

Targets that are being tracked by an AIS transponder can also be displayed on the display. Put the cursor on the AIS status indication in the information area then push the left mouse button to select an option :DISP OFF, DISP FIL, or DISP ALL. DISP FIL filters AIS targets according to the settings on the AIS filter dialog box (see the procedure below.)



# 5.4 AIS Symbols

When the AIS is turned on, AIS targets are marked with appropriate AIS symbol as below.

| SYMBOL | STATUS | REMARKS |
|---|---|---|
|  | Activated target | All AIS symbols shown with thick line. Color is selectable from menu. |
|  | ROT higher than preset ROT | Displayed for turning ship. |
| | Dangerous target | Displayed when CPA/TCPA is within CPA/TCPA LIMIT. Red in color. Flashing until acknowledged. |
|  | Lost target | “X” overlaid on a lost target. Red in color. Erased after acknowledged. |
|  | Target selected for data display | Broken square is overlaid on target selected to display its data. A, B or C shown to indicate data box location (at the right side of the screen). |
|  | Real AtoN | |
|  | Virtual AtoN | |
| | Base Station | |
|  | Airborne SAR aircraft | |

*AIS symbols*

**Note 1:** The equipment continues to process AIS targets when the AIS feature is switched off. When the AIS is again turned on, symbols are immediately displayed.

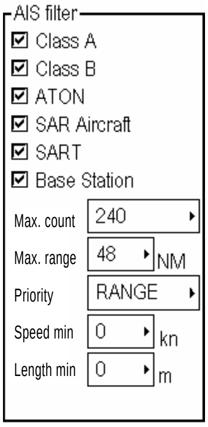
**Note 2:** AIS symbols are momentarily erased after the screen is redrawn when the heading is changed from the Head-up mode.

**Note 3:** When no AIS data is received, the message "AIS receive error" appears in the text window. Check the AIS transponder.

# 5.5 How to Filter AIS Targets

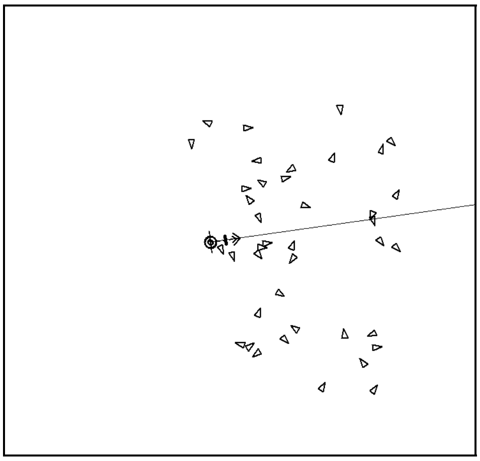
If the screen becomes cluttered with AIS targets, you can filter out unnecessary AIS targets from the AIS filter page.

1. Right-click the AIS setting indication in the information area to show the AIS filter page, shown below.

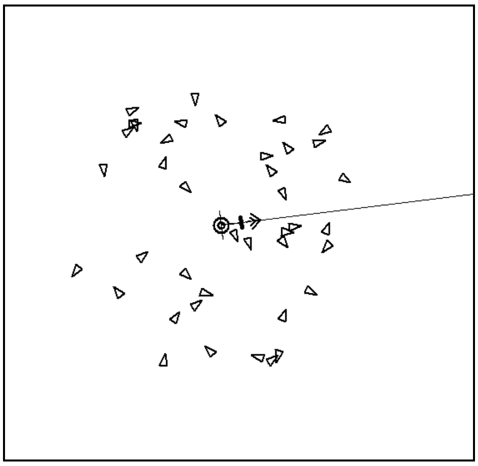



2. Check desired categories of AIS targets to show on the display, in the "AIS filter" field.
3. Select maximum number and maximum range of AIS symbols to show on the display.
4. Set Priority to select the filtering method (CPA, TCPA or RANGE), using the scrollwheel or the left button.
5. Set minimum speed and maximum length of AIS targets to show.

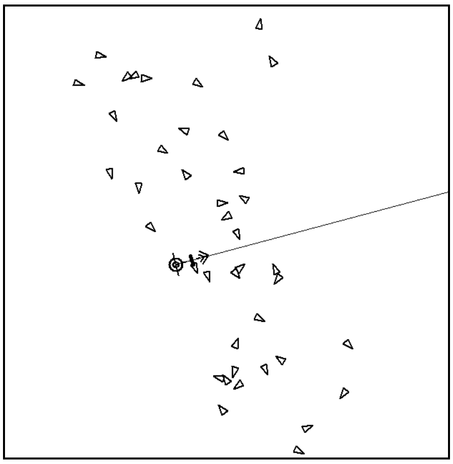
The next several pages show examples of how targets are filtered using various filtering methods.



*Filtered by CPA*



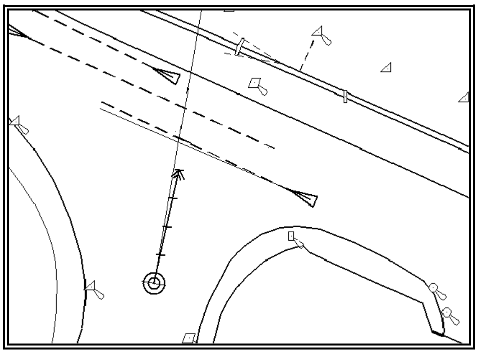
*Filtered by Range*

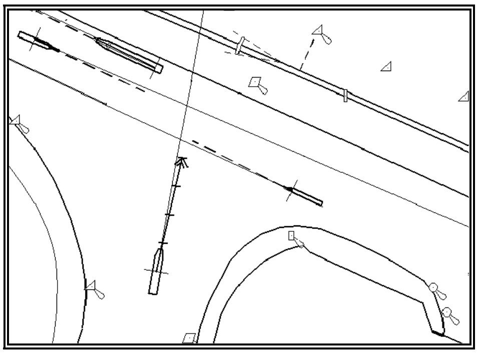


*Filtered by TCPA*

**Note**: On S57 charts, AIS and TT are displayed on top of the chart scale 1:1,000,001.

The left illustration shows AIS targets with "Outlines" and the right illustration shows AIS targets with "point symbols". Note that your ship and AIS targets are displayed as true scale symbol if the displayed chart scale is larger than set with "Ship true symbol scale" limit on the Tracking page in the Chart Display dialog box and if the size of the true scale symbol is larger than 6 mm on the chart display.



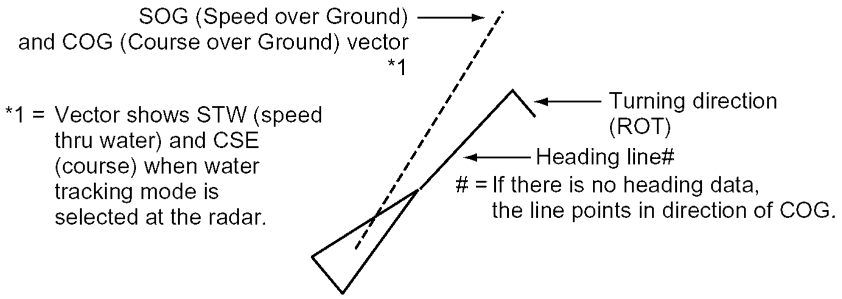


# 5.6 How to Activate Targets

When you convert a sleeping target to an activated target, an activated target's course and speed are shown with a vector. You can easily judge target movement by monitoring the vector.

## 5.6.1 How to activate specific target

On the AIS data box, click check mark to activate corresponding target. Alternatively, left-click the symbol of the target to activate.




*Activated target*

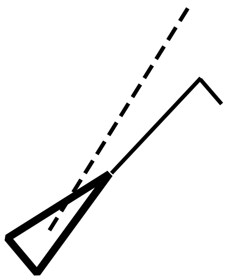
## 5.6.2 How to activate all targets

1. Use the trackball to select the AIS DISP box at the right side of the screen.
2. Push the right button to open the AIS Target dialog box.

3. Spin the scrollwheel to select Activate All then push the scrollwheel.

**Dangerous target**

When an activated target violates the CPA/TCPA alarm setting its symbol changes to the dangerous target symbol (red and flashing) and the indication "AIS Dangerous target" appears.
Press the [ALARM ACK] key (or click the ALARM ACK box with the left button) to acknowledge the CPA/TCPA alarm. The audible alarm is silenced and the symbol stops flashing.
Take appropriate action to avoid collision.

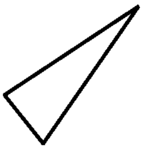


# 5.7 How to Sleep Targets

## 5.7.1 How to sleep an activated AIS target

You can "sleep" an activated AIS target as below when the screen becomes filled with targets that might prevent important radar and AIS displays from being identified. Note that targets that have been activated automatically cannot be "slept."

1. Use the trackball to put the cursor on the activated AIS target that you want to sleep.
2. Push the scrollwheel. The selected target symbol is then enclosed in a dashed square and AIS data is displayed in the AIS data box.

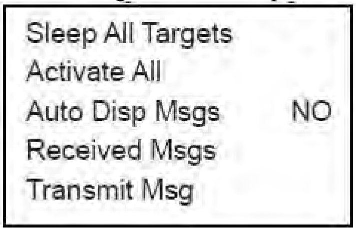


*Sleeping target*

3. Uncheck ship name you want to sleep.

## 5.7.2 How to sleep all activated AIS targets

1. Use the trackball to select the AIS DISP box at the right side of the screen.
2. Push the right button to open the AIS TARGET menu.




*AIS TARGET menu*

3. Spin the scrollwheel to select Sleep All Targets then push the left button or the scrollwheel.

# 5.8 How to Display Target Data

You can display an AIS target's data by selecting it on the display.

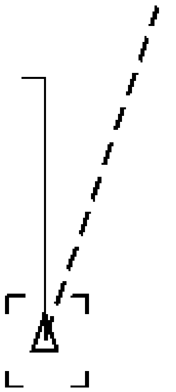
## 5.8.1 Basic data

### *From the control unit w/keyboard*

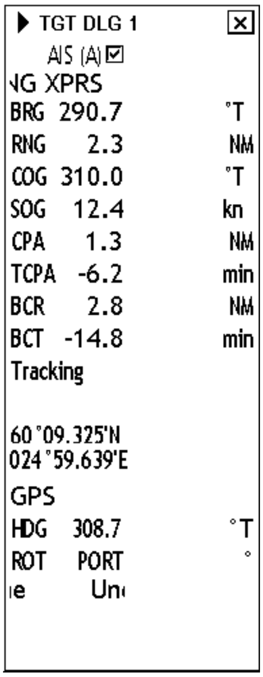
1. Use the trackball to put the cursor on the AIS target symbol you want to know its data.
2. Press the **TARGET DATA** key.

### *By trackball*

Use the trackball to put the cursor on an AIS target symbol then push the scrollwheel. The selected target is marked with a broken square and AIS data is shown in the AIS data box when the target is correctly selected.



*Activated target selected for data display*



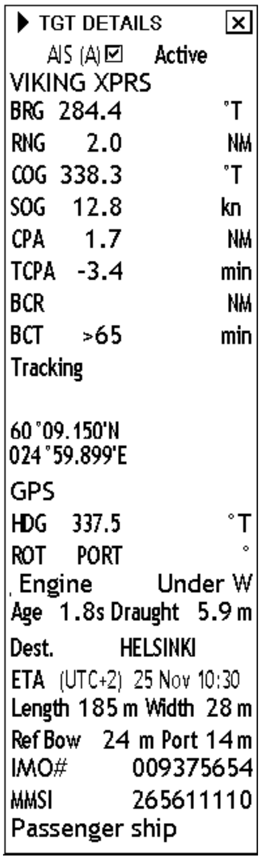

*AIS data display*

**Note 1:** AIS is switched off in dead reckoning.

**Note 2:** The indication "Query" appears when receiving only dynamic data: "Tracking" appears after receiving static data.

### 5.8.2 Detailed target data

1. Use the trackball to put the cursor on the desired AIS target in the data box at the right side of the screen.
2. Push the left button to show detailed data.




*Detailed TT data*

# 5.9 How to Set CPA and TCPA Limits

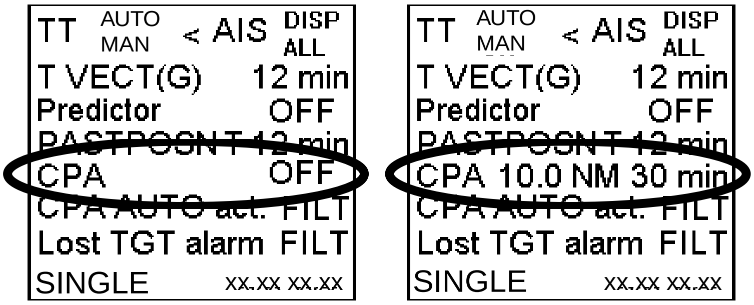
A dangerous AIS target is one whose CPA and TCPA are within the range of the CPA and TCPA limits set in the information area. A dangerous AIS target is displayed as a blinking target symbol in green and red alternately as long as you acknowledge the "AIS dangerous target" alert. Then the target symbol is displayed in red color.

You can activate or deactivate the audio alarm for dangerous targets.

## 5.9.1 How to set CPA and TCPA limits

You can set CPA and TCPA limits, in the information area.

1. Put the cursor on the text "CPA OFF" then left-click to get the distance and time fields.
2. Put the cursor on the distance value and use the scrollwheel to set distance for CPA.
3. Put the cursor on the time value and use the scrollwheel to set the TCPA.




## 5.9.2 How to activate, deactivate danger alarm for dangerous AIS targets

You can enable or disable the danger alarm (buzzer) for dangerous AIS targets as follows:

Set the cursor on the text "CPA" then right-click to get the Target alerts dialog box.

Check or uncheck Danger alarm in the AIS window as appropriate.

### 5.9.3 CPA auto activation setting

You can get automatic activation of a sleeping AIS target when it is within the set CPA limit. The options are OFF, FILT or ALL.

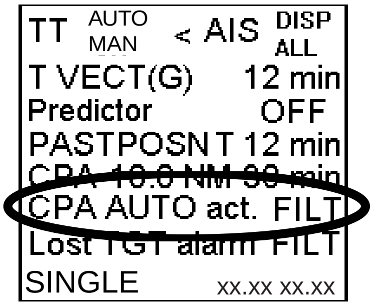
OFF activates no AIS targets inside the CPA limit

ALL activates all AIS targets inside the CPA limit

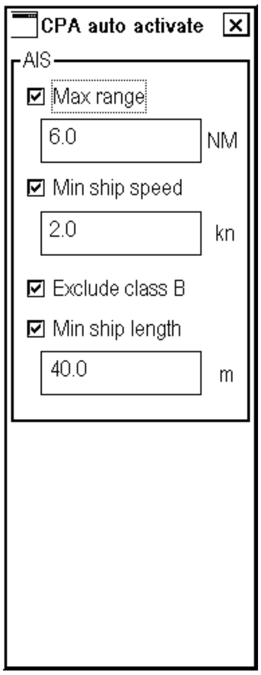
FILT activates the AIS targets inside CPA limit that meet conditions set for CPA auto activate.

Select the setting for CPA auto activation as follows

1. Put the cursor on the text "CPA auto act." then left-click to select desired option (OFF, FILT, ALL).




2. For FILT, you can set additional conditions for AIS target. Put the cursor on the text "CPA auto act." then right-click to open the CPA auto activate dialog box.



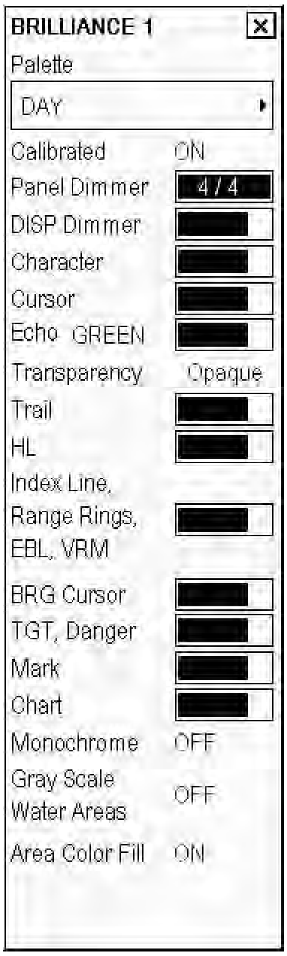

3. Set desired additional conditions for auto activation of AIS target (sleeping target->active target).

## 5.10 AIS Symbol Attributes

You can adjust the brilliance and select the size and color of the AIS symbol.

### 5.10.1 AIS symbol brilliance

1. Use the trackball to select the BRILL box at the left side of the screen then push the right button.




*BRILLIANCE menu*

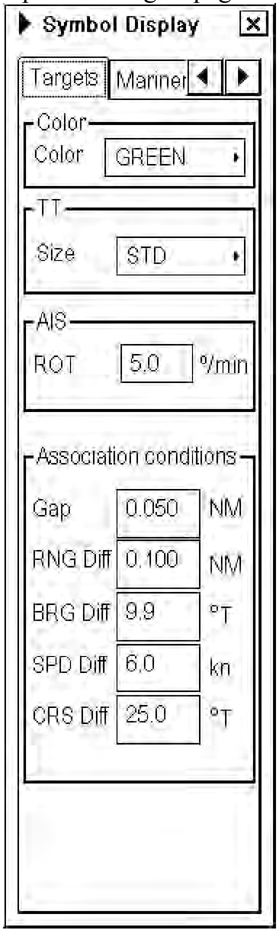
2. Select TGT, Danger then spin the scrollwheel to adjust brilliance.
3. Click the Close window button (X) to finish.

### 5.10.2 AIS symbol color, outlines, ROT

You can select the size and color of the AIS symbol as follows:

You can specify the number of AIS targets to show as follows:

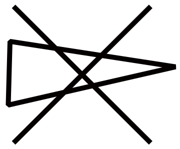
1. In the radar or chart radar mode, use the trackball to select the Symb DISP box at the right side of the screen then push the left button. For the ECDIS mode, show Symbol Display/Info in the guidance area, push the left button then click Chart Display on the menu.
2. Open the Targets page.




*Targets page*

3. Select the color for AIS targets with Color, from among green, blue, cyan, magenta and white.
4. You can set the limit for the ROT to display the curved speed vector.
5. Open the General page.
6. You turn the outlines (symbol minimum size is limited; width is more than 7.5 mm) of the AIS symbol on or off as appropriate.
7. Click the Close window button (X) to close the menu.

## 5.11 Lost AIS Targets



A target is declared a lost target when it fails to produce data for six minutes or five reporting intervals, whichever is the shorter. When this occurs, the target is marked with the (flashing) lost target symbol and the indication "AIS lost target" appears.

To acknowledge a lost target, push the **ALARM ACK** key or use the trackball to select the ALARM ACK box then push the left button.

Time out for indication of lost active AIS target is as shown in the table below:

| Vessel speed (kn) | Period for time out |
|---|---|
| at anchor | 18 min |
| 0-14 | 60 s |
| 14-23 | 36 s |
| > 23 | 12 s |

Automatic removal of lost active AIS target occurs under the following conditions:

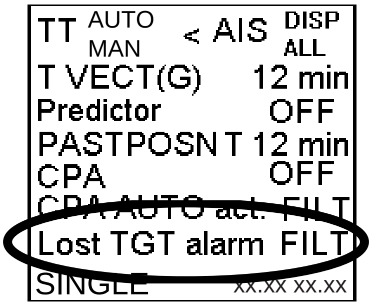
- When the user acknowledges "Lost AIS target" alert for active AIS target.
- When "Lost AIS target" state has occurred for two minutes.
  Exception is moored/anchored active AIS target when time of period is 36 minutes.

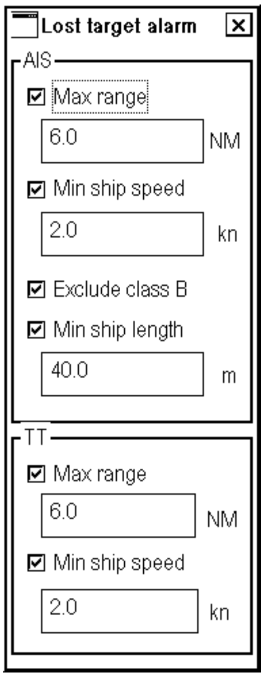
**Note 1:** If a TT lost target mark is displayed when the **ALARM ACK** key is pushed (or the ALARM ACK box is clicked) to acknowledge an AIS lost target, the TT lost target will also be erased.

**Note 2:** The AIS data transmission interval depends on target’s speed. For example, the data is transmitted every 10 seconds on the ship speed of 0 to 14 kn and every two seconds on the ship speed of more than 23 knots. For details, see the owner’s manual of the AIS.

### 5.11.1 How to enable, disable audio alarm for lost target

1. Put the cursor on the text "Lost TGT alarm" then left-click to select desired option (OFF, FILT, ALL).
2. For FILT, you can set additional conditions for lost AIS target and TT. Put the cursor on the text "Lost TGT alarm." then right-click to open the Lost target alarm dialog box. Set desired additional conditions for lost AIS target in the AIS field (Max range, Min. ship speed, Exclude class B, and Min. ship length).

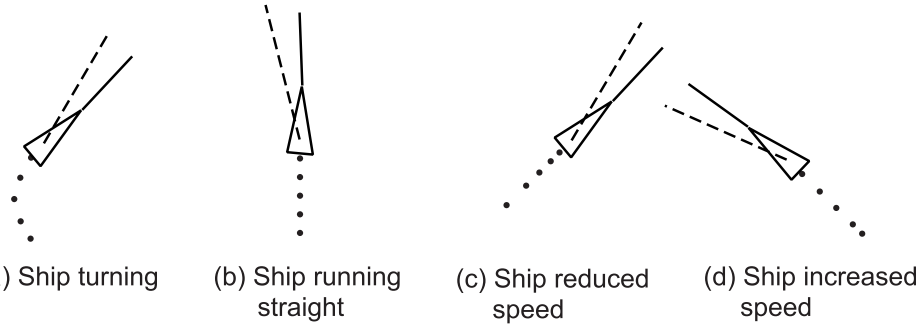


# 5.12 How to Display AIS Target Past Positions

The past position display shows equally time-spaced dots marking past positions of activated AIS targets. If a target changes its speed, the spacing will be uneven. If it changes course, its plotted course will not be a straight line.

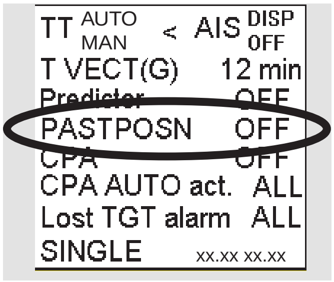
Below are sample past position displays.




*Sample past position displays*

## 5.12.1 How to display and erase past position points, select past position interval

1. Use the trackball to select the Past Posn indication at the right side of the screen.




*Past Posn indication*

2. Do one of the following to select a past position time.

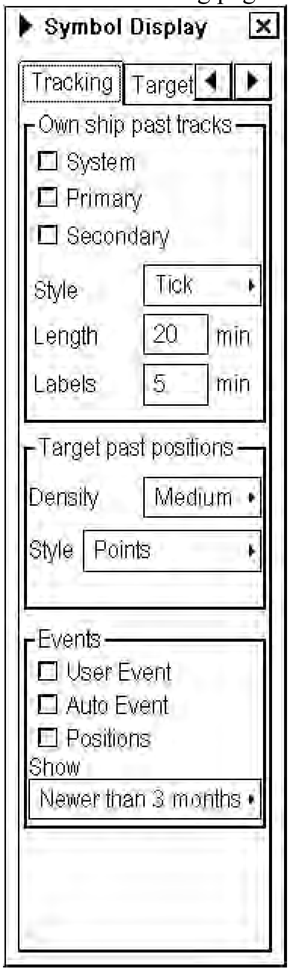
| Control | Available setting |
|---|---|
| Scrollwheel | 1, 2, 3, 5, 6, 10, 12, 15, 20, 30, 40, 50, 60 min |

3. Push the left button to confirm selection.

### 5.12.2 Past position display attributes

You can select the interval of past positions points and style of past position points.

1. Use the trackball to select the Symb DISP box at the right side of the screen then push the left button.
2. Select the Tracking page.

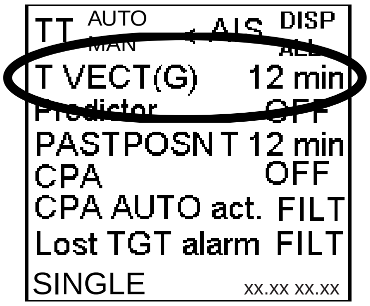



3. Use the trackball to select the value of "Target past positions" for Density and Style in the Target past positions window.
4. Click the Close window button (X) to close the menu.

## 5.13 How to Display True or Relative Speed Vectors

AIS targets vector can be displayed relative to your ship's heading (R VECT) or with reference to the North (T VECT).

Vector time (or the length of vectors) and presentation mode can be set on the sidebar, at the locations circled in the illustration below.




For further information, see section 4.9 Vector Modes.

## 5.14 Association of TT and AIS Targets

An AIS-equipped ship is usually displayed by two symbols on the radar display. This is because the AIS ship position is measured by a GPS navigator (L/L) on that ship whereas the radar detects the same ship by PPI principle (range and bearing relative to own ship radar antenna).

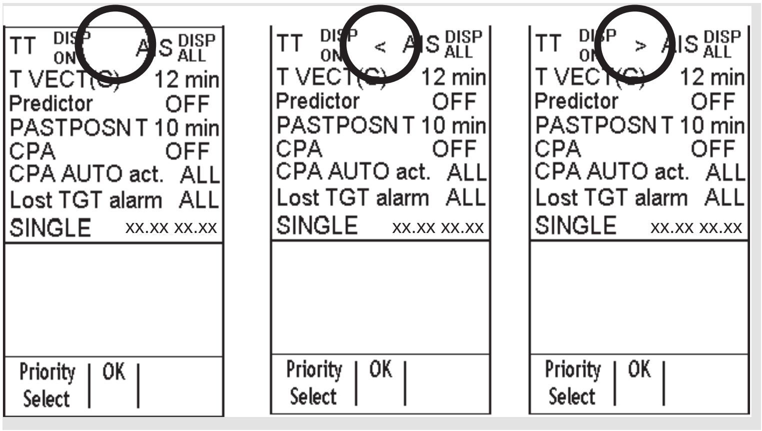
To avoid the presentation of two target symbols for the same physical target, the "association" function is incorporated. If target data from both AIS and radar plotting functions are available and if the association criteria are fulfilled, only the activated AIS target symbol is presented.

Association will not happen between AIS and TTs if:

- AIS target is sleeping
- AIS target is lost

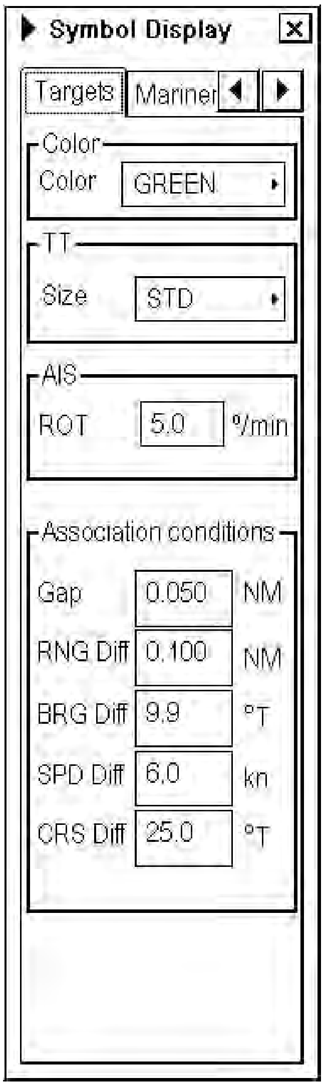
### 5.14.1 How to activate association

1. Put the cursor on the location indicated below.




2. Push left button once to get "<" sign to select AIS symbol for associated target, push left button once more to get ">" sign to select TT symbol for associated target, push left button once again to deactivate target association.
3. Use the trackball to select the Symb DISP box at the right side of the screen then push the left button.

4. Open the Targets page.




5. Enter data in the Association conditions window referring to the following:
   **GAP**: Range between AIS target and TT.
   (setting range: 0.000-0.999(NM))
   **RNG Diff**: Enter the range difference from own ship to AIS target and TT.
   (setting range: 0.000-0.999(NM))
   **BRG Diff**: Enter the bearing difference from own ship to AIS target and TT.
   (setting range: 0.0-9.9(°))
   **SPD Diff**: Enter the speed difference between AIS target and TT.
   (setting range: 0.0-9.9(kn))
   **CRS Diff**: Enter the course difference between AIS target and TT.
   (setting range: 0.0-99.9(°))

6. Click the Close window button (X) to close the menu.

When the association criteria are met, the TT symbol is erased and only the AIS symbol is displayed. Further, "ASSOC" appears at the Target dialog box at the time of conversion.

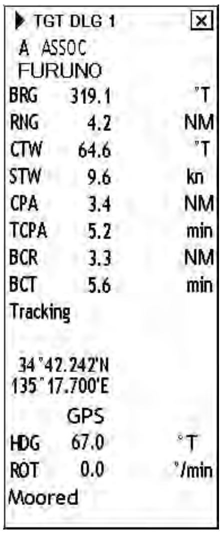
### *Basic AIS target data*

**From the control unit w/keyboard**

1. Use the trackball to put the cursor on the AIS target symbol you want to know its data.
2. Press the **TARGET DATA** key.

**By trackball**

Use the trackball to put the cursor on an AIS target symbol then push the scrollwheel. The selected target is marked with a broken square and AIS data is shown in the AIS data box when the target is correctly selected. Ship name is shown near the target. If ship name is not available, MMSI no. appears.

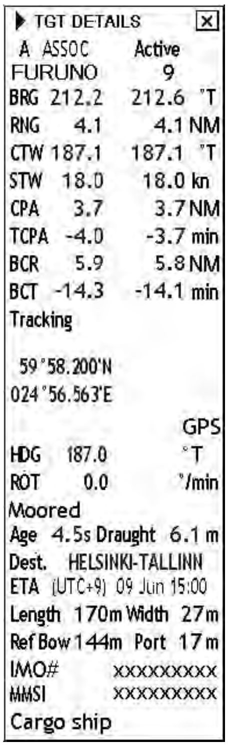


*Association data display, basic data*

### *Detailed AIS target data*

1. Use the trackball to put the cursor on the desired AIS target in the data box at the right side of the screen.
2. Push the left button to show detailed data.

The Targets dialog box shows information from AIS and TTs. Left hand side is data from AIS target and right hand side data from TT.

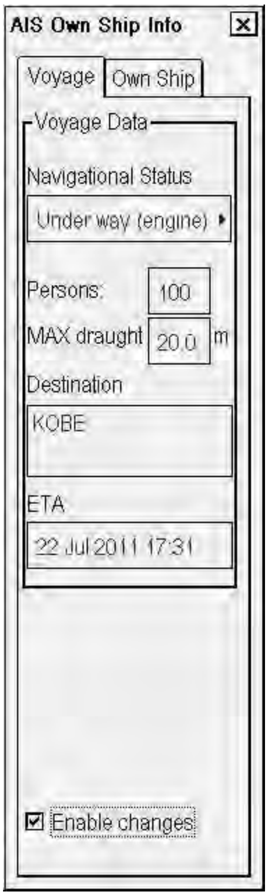


*Association data display, detailed data*

## 5.15 AIS Own Ship Info

Own ship information sent by the AIS transponder can be modified in Chart Radar. This information contains voyage related data and ship related data. To view or modify own ship information, do following:

1. Display Menu/Info/Chart Menu in the mouse functions area then push the left mouse button to open the Main menu.
2. Choose AIS Own Ship Info from the menu then push the scrollwheel to show the AIS Own Ship Info dialog box, consisting of the pages "Voyage" and "Own Ship".



3. If you need to change any information, check the "Enable changes" box then modify desired field.

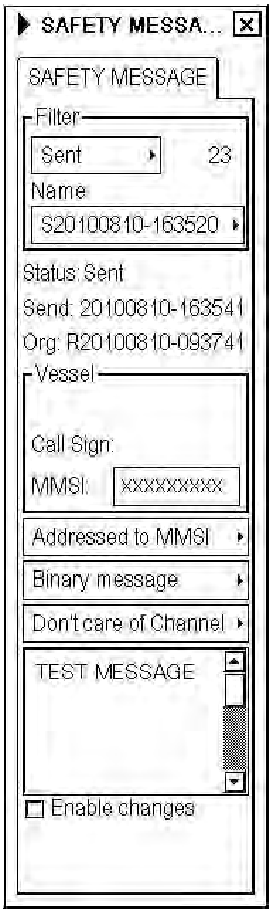
# 5.16 AIS Safety Messages

## 5.16.1 Introduction

You can send and receive messages via the VHF link, to a specified destination (MMSI) or all AIS-equipped ships in the area. Messages can be sent to warn of safety of navigation, for example, an iceberg sighted. Routine messages are also permitted. Short safety related messages are only an additional means to broadcast safety information. They do not remove the requirements of the GMDSS.

To open the Safety message menu, which is where all phases of AIS safety messages are initiated, do the following:

1. Display Menu/Info/Chart Menu in the guidance area then push the left button to open the Main menu.
2. Select Safety Message from the menu then push the scrollwheel to show the SAFETY MESSAGE dialog box.




The SAFETY MESSAGE menu contains the following items:

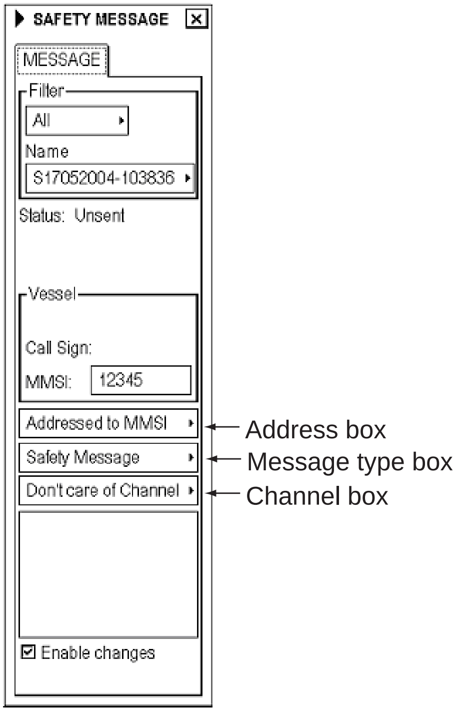
**Filter:** Select category of messages to show in the Safety Message menu.
**Name:** Each message has an individual name based on time of creation or time of receiving of message.
**Status:** Display status of selected safety message.
**Send:** Display date and time when message is sent.
**Org:** Original message name is displayed here if selected safety message is reply for received message.
**Vessel:** AIS target related information is displayed in this field.
**Address:** Select how to send a safety message.
**Msg Type:** Select message format.
**Channel:** Specify channel for transmitting.

## 5.16.2 How to create a new safety message

You can create a safety message for transmission by the AIS transponder. This can be done as follows:

1. Display Menu/Info/Chart Menu in the guidance area then push the left button to open the Main menu.
2. Select Safety Message from the menu then push the scrollwheel.
3. Put the cursor on the triangle in the menu to show the submenu.

4. Select Create Message from the menu then push the scrollwheel.




5. Check Enable changes.
6. Put the cursor in the Address box. Spin the scrollwheel to select Addressed to MMSI or Broadcast to All as appropriate then push the scrollwheel. Select Addressed to MMSI to send the message to a specific ship (AIS equipped) or Broadcast to All to send to all nearby AIS transponder-equipped ships. For Addressed to MMSI, enter MMSI of ship in the MMSI input box, in the Vessel window.
7. Select message type at Message type box: Safety message for safety message, Binary message for routine message.
8. At the Channel box, select channel over which to broadcast your message. The choices are Channel A; Channel B; Channel A and Channel B and Don't care for channel.
9. Enter the text of your message in the box below Channel. The number of characters that may be entered depends on message type.

| | |
|---|---|
| Safety message broadcast: | 161 characters |
| Binary message broadcast: | 156 characters |
| Safety message addressed to MMSI: | 156 characters |
| Binary message addressed to MMSI: | 151 characters |

10. To send the message, put the cursor on the triangle to show the sub menu, select Send then push the scrollwheel.
11. If message is sent successfully, status is changed from Unsent to Sent.

### *How to get ship information for an addressed safety message*

You can find ship information for an addressed safety message. This is useful when you want to send a safety message to a specific ship. To get ship information, proceed as follows:

1. Display Menu/Info/Chart Menu in the guidance area then push the left button to open the Main menu.
2. Select Safety Message from the menu then push the scrollwheel.
3. Put the cursor on a desired AIS target on the display then push the scrollwheel to get MMSI number, call sign and ship name of the target. Call sign and MMSI of the ship selected are shown in the Vessel field in the Safety Message menu.
4. To send a message to the ship, select Addressed to MMSI from the Address box and set other items as appropriate, referring to the procedure on the preceding page.

## 5.16.3 How to read a received safety message

When a message is received by AIS, it is indicated on the chart radar with the alert "634 AIS message received". To read the message, do the following:

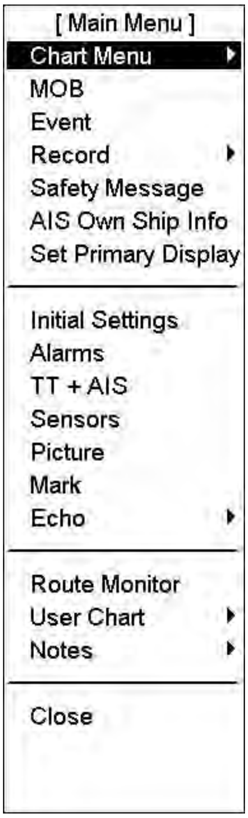



*Chart radar main menu*

1. Display Menu/Info/Chart Menu in the guidance area then push the left button to open the Main menu.
2. Select Safety Message from the menu then push the scrollwheel.
3. In the Filter field, select "Received" from the topmost box and the message in the Name box below it.

### 5.16.4 How to reply to a safety message

To reply to a safety message, proceed as follows:

1. Open the menu and show the Safety Message dialog box.
2. In the Filter field, select "Received" from the topmost box and the message to reply to in the Name box below it.

3. Check Enable changes.
4. Select Msg Type and Channel as appropriate.
5. Enter your reply in the text window.
6. Put the cursor on the triangle to open the sub menu.
7. Select Send Message then push the scrollwheel.

# 5.17 AIS Alerts

AIS alerts are displayed at the bottom right corner of the screen. The table below shows the AIS alerts and their meanings.

*AIS alerts*

| Message no. | Message | Alert category | Description |
|---|---|---|---|
| 632 | AIS dangerous target | Alarm | AIS target has met dangerous target limit set by CPA and TCPA. |
| 633 | AIS lost target | Warming | No update information received from tracked AIS target within defined reporting interval of ship type. |
| 634 | AIS message received | Warming | AIS message received. |
| 635 | AIS target in ACQ ZONE | Warming | AIS target has entered an acquisition zone. The target's symbol is red and flashing. |
| 636 | AIS display 95% full | Warming | When 95% of display capacity for AIS targets is reached. |
| 637 | AIS display 100% full | Warming | When 100% of display capacity for AIS targets is reached. |
| 638 | AIS storage 95% full | Warming | When 95% of storage capacity for AIS targets is reached. |
| 639 | AIS storage 100% full | Alarm | When 100% of storage capacity for AIS targets is reached. |
| 737 | AIS receive error | Warming | Not receiving AIS data from own AIS (VDO message). |

# 6. ECDIS Overview

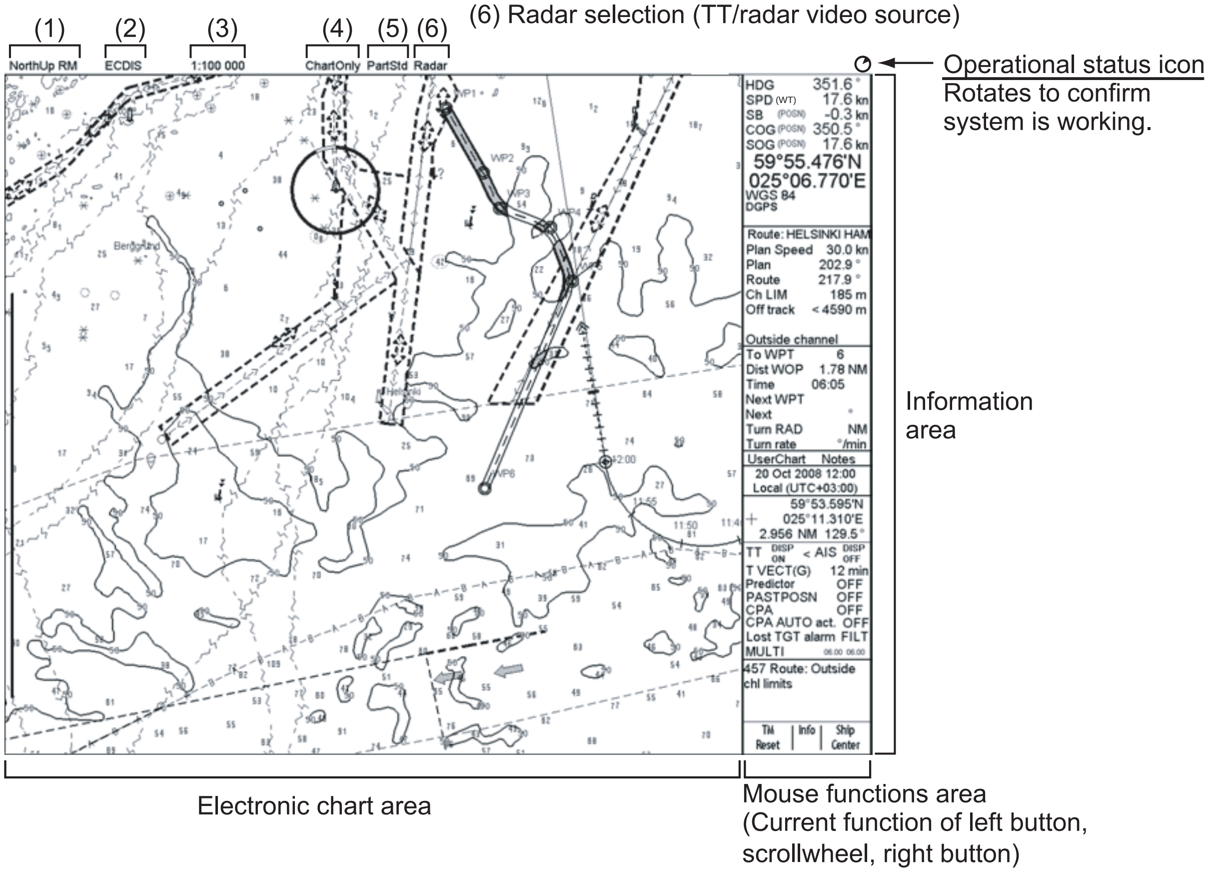
## 6.1 ECDIS Overview

The ECDIS (Electronic Chart Display and Information Systems) screen is divided into several areas. The **Status bar**, which is always shown at the top of the screen, mainly displays equipment status.

The boxes at the right side of the screen comprise the **Information areas**. They are permanently displayed and show information such as own ship position, alerts generated by the system, and cursor position. The operator may display the data of his or her choice in one of the information areas called a **Sidebar**. (See section 6.1.3 Sidebar on user interface.) The bottom block in the information area is the **Guidance area,** and it shows the current left button, scrollwheel and right functions, from left to right.

The Electronic chart area takes up 7/8 of the ECDIS display.

(1) Presentation mode
(2) ECDIS mode
(3) Display scale
(4) Chart only switch
(5) Name of display settings (DspBase, PartStd, Std, All, AllOther)*
(6) Radar selection (TT/radar video source)




*DspBase: When no options are checked on Standard page.
PartStd: When some of options (not all) are checked on Standard page.
Std: When all options are checked on Standard page and no options are checked on Other1/Other 2 pages.
Other: When all options are checked on Standard page and some options (not all) are checked on Other1/Other2 pages.
AllOther: When all options are checked on Standard page and all options are checked on Other1/Other2 pages.

*Parts of the ECDIS display*

### *Electronic chart area*

The ECDIS can use the two types of charts: S57ed3 ENC charts (vector) and CM-93 charts (vector)

The following information can also be displayed:

1. Cursor (moved by trackball)
2. Planned route
3. EBL (Electronic Bearing Line) and VRM
4. Own ship symbol with speed vector

The ECDIS combines chart and navigational information. It should be noted that modern navigation systems (e.g., differential GPS) may offer more accurate positioning than what was used to position some of the surveys from which the electronic navigational chart was derived.

#### S57 vector format

ECDIS is compatible with S57 release 3 ENC format charts. From this format the ECDIS generates the "system ENC", = SENC, which is used for actual operations of the ECDIS.

When opening a chart it is displayed with the default scale called the compilation scale. The details for the chart are displayed in the electronic chart area and these can be modified. You can change the chart scale with the ZOOM IN and ZOOM OUT functions, and the scale range is 1:1,000 - 1:50,000,000.

## 6.1.1 User interface

The user interface is defined as the areas that are not displaying the electronic chart.

The user interface contains information about settings, parameters and selections used by ECDIS. The nature of the information displayed can be either static (such as name of a certain window, fields in chart legend, units, etc.) or dynamic (such as position of own ship, time, user selections, etc.).

### *Color palettes for the user interface*

There are several color palettes available for choosing colors for the chart background and information areas.

| Setting | Background color of chart | Background color of information area |
|---|---|---|
| Day Bright | Light-blue | White |
| Day Blue | Light-blue | Dark-blue |
| Dusk | Blue | Black |
| Dusk Blue | Blue | Dark-blue |
| Night | Dark-blue | Black |

With any palette selection except Day Bright, static text from dynamic text is shown in different colors to help you distinguish between them. For example, dynamic data like own ship position, time or direct control of parameters (scale, predictor time, etc.) is shown in yellow color.

To choose a color palette, do the following:

1. Set the cursor in the electronic chart area.
2. Spin the scrollwheel until Chart Display/Info/Standard Display is shown in the guidance area.
3. Push the left button to open the Chart Display dialog box.
4. If the "Chart" page is not selected, click an arrow tab in the dialog box to display it.
5. Put the cursor on Palette.
6. Spin the scrollwheel to choose desired palette, referring to the table on the previous page, then push the scrollwheel.
7. Click the Close window button (X) at the top right corner of the dialog box to close the box.

**Note:** The display colors may change to the Windows standard color palette whenever a USB memory device is inserted or removed. (When Windows initiates USB recognition procedures, the Windows standard color palette is restored.) To restore the ECDIS color palette, open the Chart Display menu and follow the procedure on the previous page.

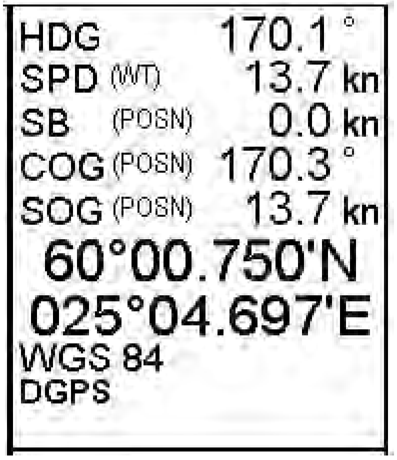
### 6.1.2 Information area

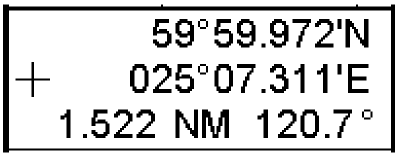
The information area displays details about own ship position, course and speed and the cursor's location on the chart

Information from the positioning sensors:

- HDG heading and its source if it is not true gyro.
- SPD longitudinal speed
- SB, Transversal speed, positive value to Starboard.
- COG (Course over ground) and its source
- SOG (Speed over ground)
- Latitude and longitude position of own ship
- Datum in use (WGS 72, WGS 84, European 1950, etc.), which is shown above positioning source.
- Positioning source: Dead Reckoning, GPS, DGPS, LORAN, FILTER, etc.
- Latitude and longitude position of cursor displayed in chosen datum.
- Range and bearing from your ship's position to cursor

**Note:** The order of items in the position and cursor windows can change with the sidebar used. See the next page.

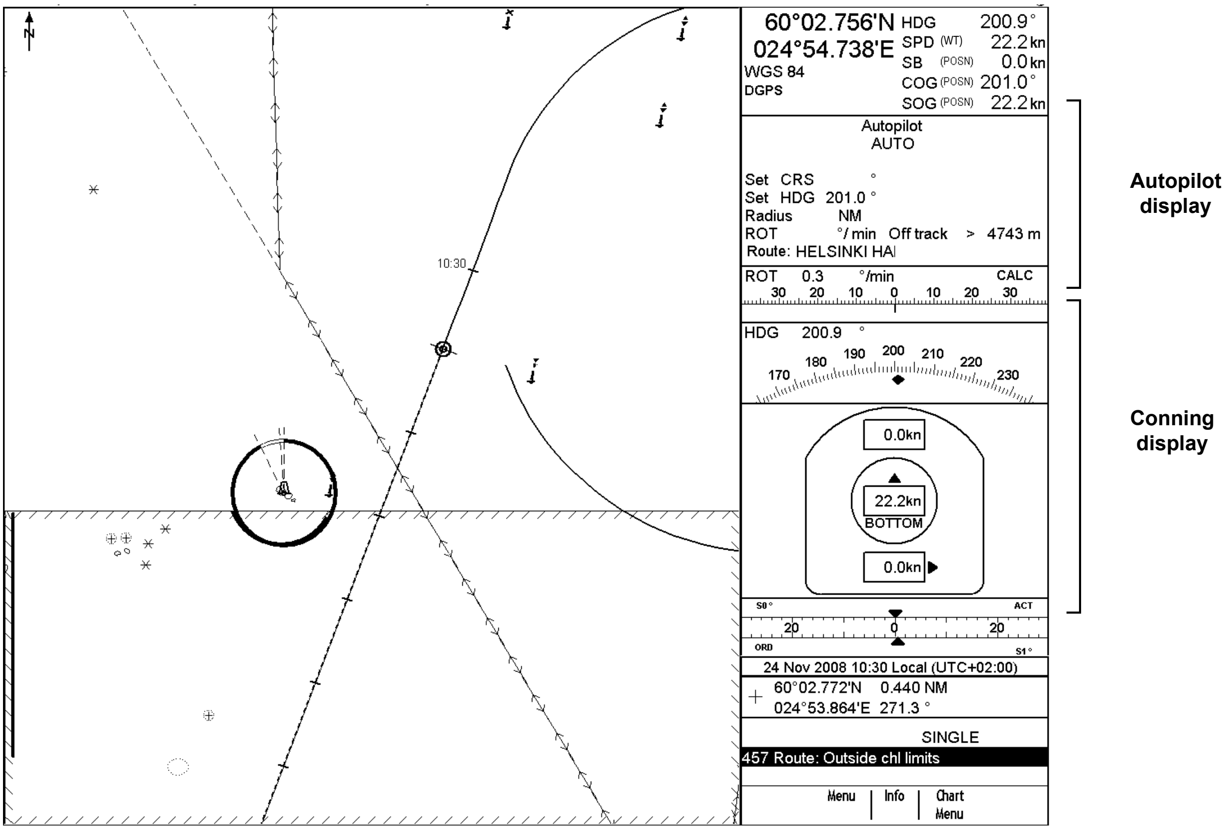


### 6.1.3 Sidebar on user interface

You can choose what kind of information to display in the sidebar (right side) of the ECDIS. The options shown below are available and the content of the sidebar windows change with the devices and sensors connected to the system. The Route display or Autopilot display is displayed always. You can display one of them together with the Conning display, Docking display or Chart legend. When two sidebars are active, the width of the information area is doubled, as shown below.

- Route display
- Autopilot display
- Conning display
- Docking display
- Chart legend



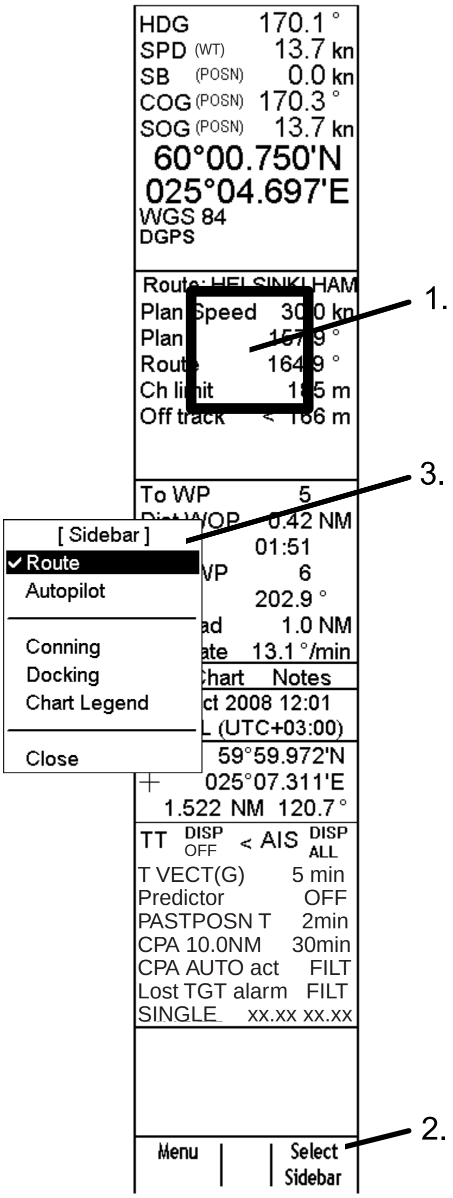

*Sidebar, with autopilot and conning display windows*

### *How to open the sidebar on the display*

Sidebar(s) may be opened as shown below. Two sidebars may be displayed.

1. Put the cursor on the area shown.
2. "Select Sidebar" appears in the guidance area. See figure at right.
3. Push the right button to show the sidebar menu on the display.
4. Spin the scrollwheel to choose desired sidebar from the menu then push the scrollwheel.

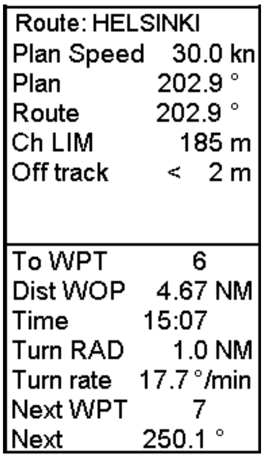
**To remove an item from the sidebar,** deselect it following this procedure.



### *Information in route sidebar*

The following information is shown in the route sidebar:

Information from route monitoring:




Route: Name of monitored route

- **Plan Speed:** Planned speed to approach "To WPT".
- **Plan:** Planned course between previous WPT and "To WPT".
- **Route:** Calculated set course to follow the monitored route, including off track, drift and gyro error compensation.
- **Ch LIM:** Planned width of channel to approach "To WPT".
- **Off track:** Perpendicular distance the ship is from the intended track.
- **To WPT:** The waypoint that the ship is approaching.
- **Dist WOP (Wheel Over Point):** Distance to the point where rudder order for course change at "To WPT" will be given.
- **Time:** Time to go to WOP (dd:hh:mm:ss).
- **Turn RAD:** Planned turning radius at "To WPT".
- **Turn rate:** Calculated rate of turn that is based on current speed and planned turning radius.
- **Next WPT:** The WPT following the "To WPT".
- **Next:** Planned course between "To WPT" and "Next WPT".

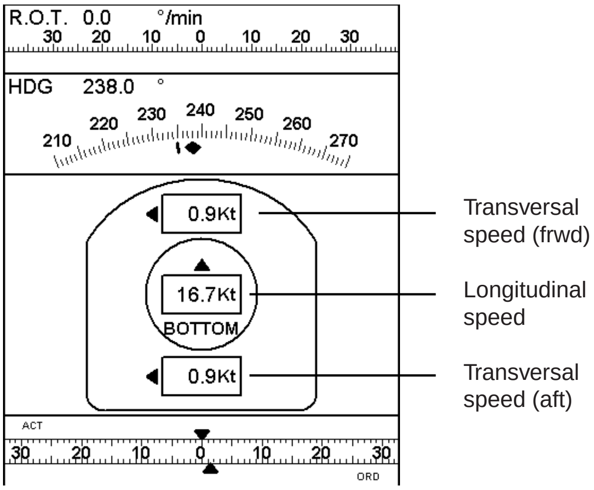
The following information is calculated from data of positioning sensors and from route monitoring data:

- Route
- Off track
- Dist WOP
- Time
- Next

### Information in conning display sidebar

The following information is shown in the conning display sidebar:

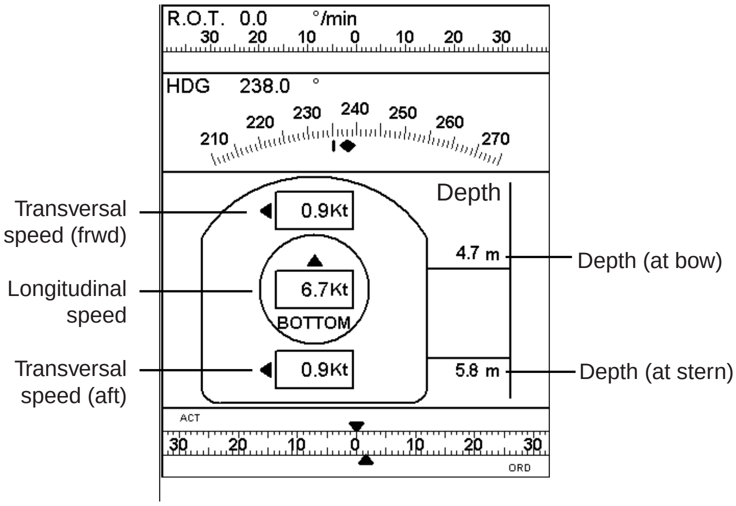
- ROT indicator
- Heading indicator
- Speed indicators
  - Longitudinal speed and source of speed
  - Transversal speed
- Rudder angle indicator




### Information in docking sidebar

The following information is shown in the docking sidebar:

- ROT indicator
- Heading indicator
- Speed indicators
  - Longitudinal speed and source of speed
  - Transversal speed
- Rudder angle indicator
- Depth below transducer
  - On bow
  - On stern

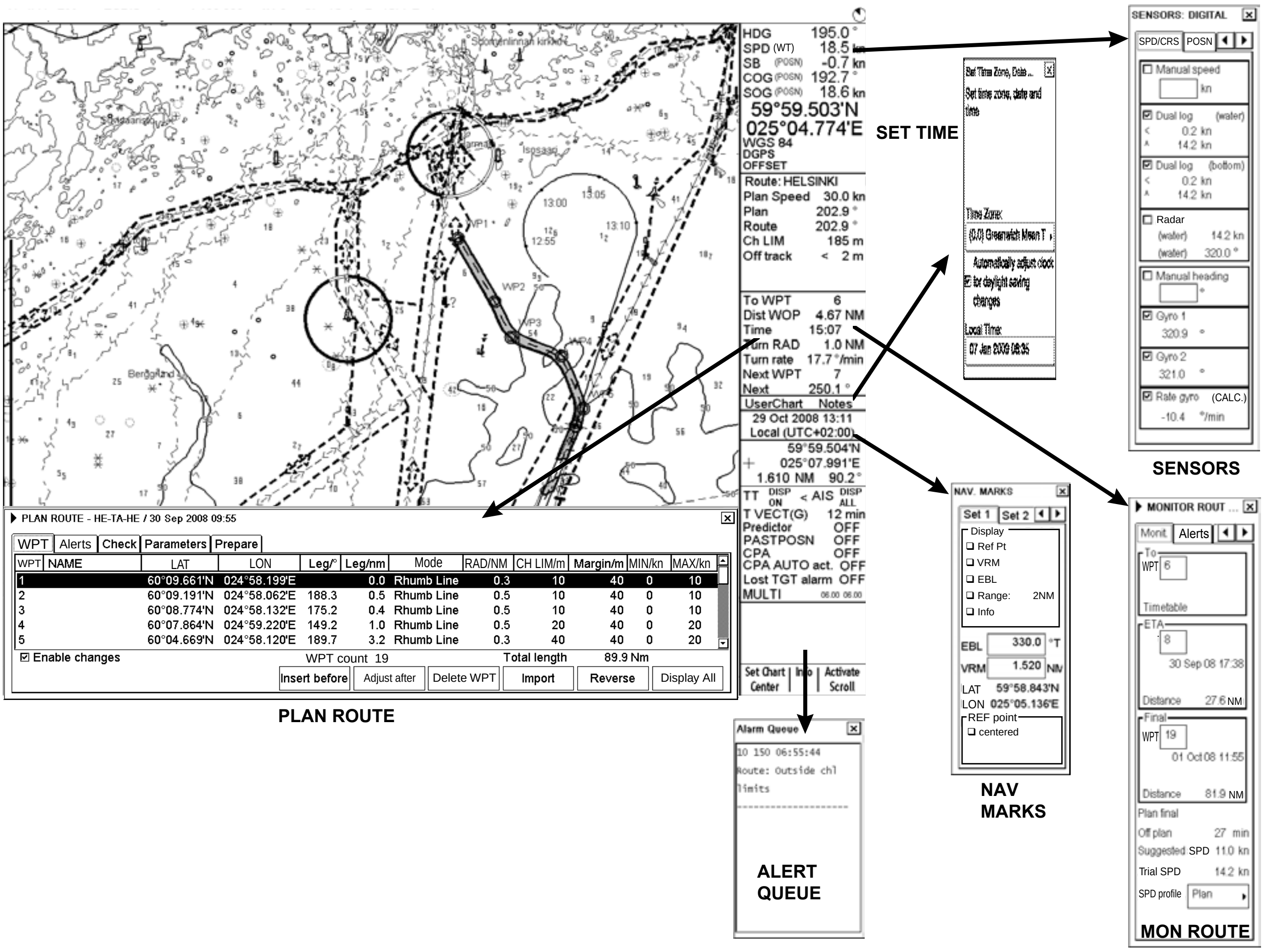



### Information in chart legend sidebar

For detailed information see Chapter 7 Vector Chart.

### *How to show dialog boxes on the display*

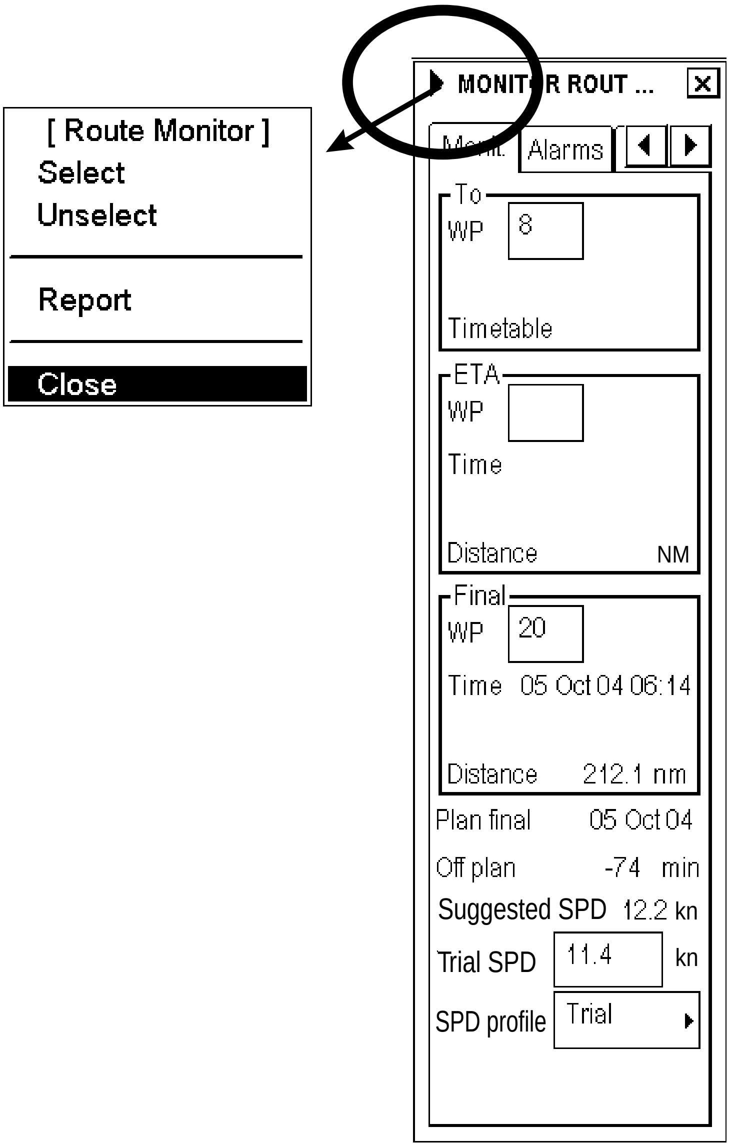
There are several dialog boxes that can be activated by mouse-clicking over certain areas on the ECDIS display. Put the cursor over the appropriate area then pushing the right or left button to display the corresponding dialog box on the ECDIS display. See the figure below to find the places and button to push to get desired dialog boxes on the display. To close a dialog box, click the X at the top right corner of the dialog box. Note that only one dialog box may be shown at a time.



### *Additional menu functions in dialog boxes*

A dialog box that has a triangle at its upper left-hand corner contains a menu that provides additional functions. See the figure at right. Put the cursor on the triangle to show a menu from which to choose additional functions.

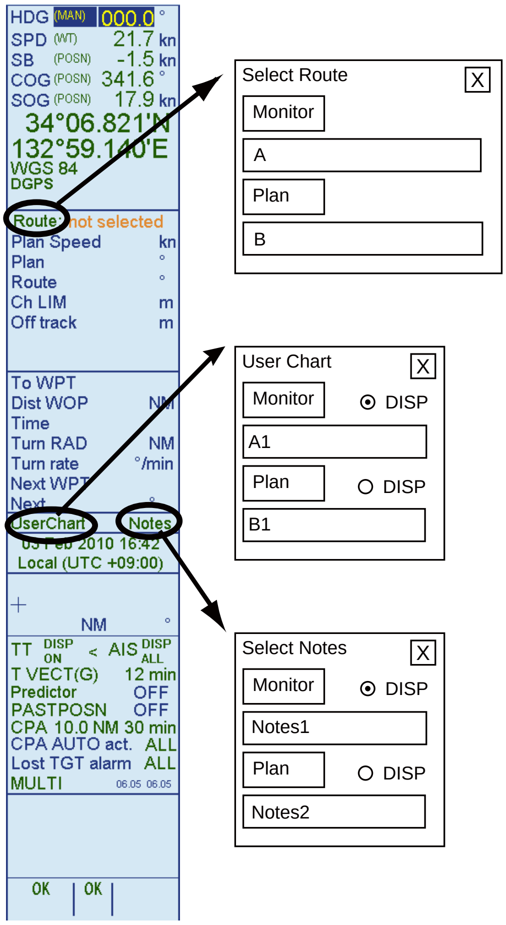
**Note:** A menu will also appear if you try to activate a dialog box without choosing an option from the menu.



### 6.1.4 How to control planning and monitor modes on the ECDIS display

A route, a user chart or Notes can be displayed at the top of the electronic chart, in either the plan mode or the monitor mode.

To choose desired mode, put the cursor on the text Route, UserChart or Notes in the sidebar. A drop-down dialog box appears, where you can choose either Monitor or Plan by clicking the appropriate button with the left button. With User Chart or Notes, only the plan mode or the monitor mode can be displayed in the sidebar. (Display selected may be activated with a radio button. See the figure below.)




## 6.2 How to Set up Before Departure

#### *Update chart material*

Update your S57 chart material before embarking on a new voyage. To get more information about updating S57 charts, see Chapter 7 Vector Chart.

#### *Display and approve dates for S57 charts and manual updates*

**Note:** It is very important that you set the Display and Approve dates for S57 charts as the current date.

There may be features that require chart viewing dates or seasonal dates in S57 charts. Accordingly, if you have not set Display and Approve dates as the current date there is a possibility that you can get a wrong presentation or some feature may be absent. For how to set Display and Approve dates, see section 7.11 Chart Viewing Dates and Seasonal Features of the Vector Chart.

#### *Create or update user chart*

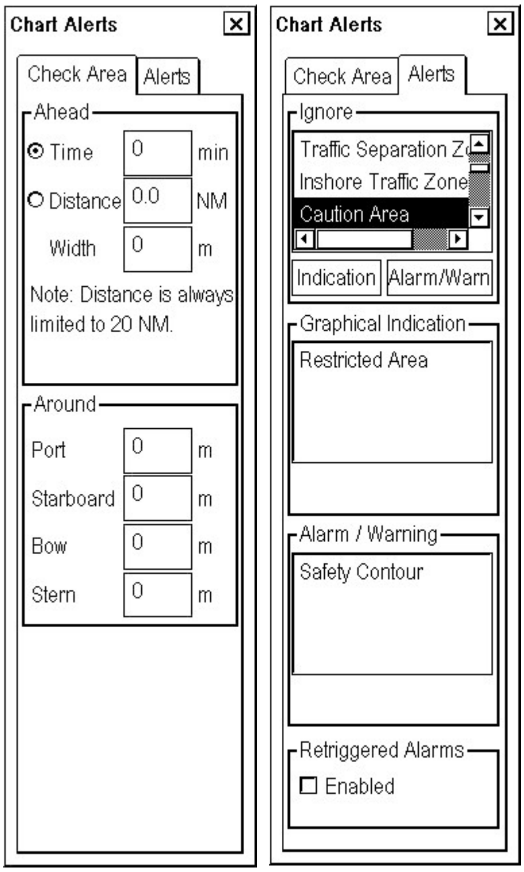
If necessary, create a new user chart or modify an existing one. For more information about user charts, see Chapter 12 User Chart Control.

### *Create or update Notes*

If necessary, create a new Notes or modify an existing one. For more information about Notes, see Chapter 13 Notes.

## 6.2.1 How to set chart alert calculation

Set chart alert areas suitable for your coming voyage. For more information, see Chapter 9 Chart Alerts.




## 6.2.2 Creating or updating a route

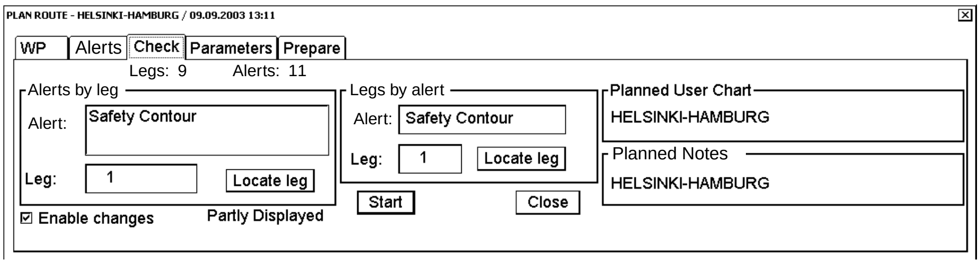
Create a new route or modify an existing one. For further information about creating or updating a route, see Chapter エラー! 参照元が見つかりません。 エラー! 参照元が見つかりません。.

### *Checking your route against chart alerts*

Before you sail your route, you should always check your route against chart alerts. This is important because your S57 charts and manual updates may contain chart viewing dates information. You can check chart alerts from the Check page on the Plan Route menu. You can access this menu by placing the cursor on Route in the sidebar, clicking the **Plan** button to show the Plan Route menu and clicking the Check tab.

The following information is stored with the route during route plan:

- Conditions for chart alerts during route monitoring, which includes safety contour and other chart alerts.
- Name of the user chart to be used during route monitoring together with this planned route.
- Name of the Notes to be used during route monitoring together with this planned route.



To store selections on the Alerts page, click the **Start** button. Also, the name of the user chart and the name of Notes, which were selected as plan mode, are stored in this route.

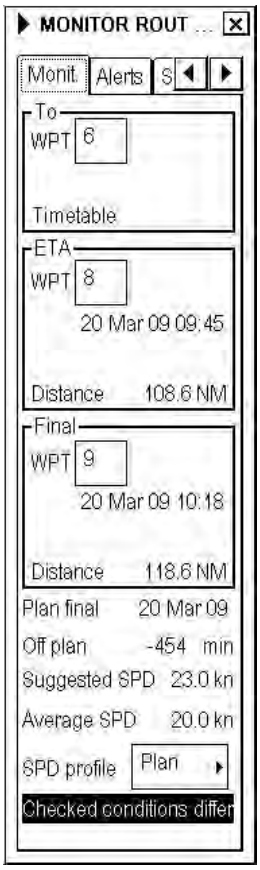
### *How to recalculate timetable and ETA values*

Timetable and ETA values can be recalculated from the Parameters page in the Plan Route menu. Minimally set ETD to equal departure time, and perform desired optimization.

After checking the chart alerts and setting the ETD, cancel selection of the planned route in order to enable the selection of it as the route to be monitored, using "Unselect" in the Plan Route menu, or use "Exchange with Monitored" on the same sub menu to select it directly as monitored route.

## 6.2.3 How to check and prepare route to monitor

Select a route for the next voyage: Select Route in the sidebar and click the **Monitor** button. For more information about route selection, see Chapter 11 Route Monitoring.




If the text "Checked conditions differ" appears in the menu, this means that conditions selected during route planning were different than those selected for use during route monitoring.

### How to select TO waypoint

The system selects a TO waypoint automatically. Check that it is the correct one. Note that waypoint number 1 is not accepted. Use the Monitor Route menu to select a waypoint.

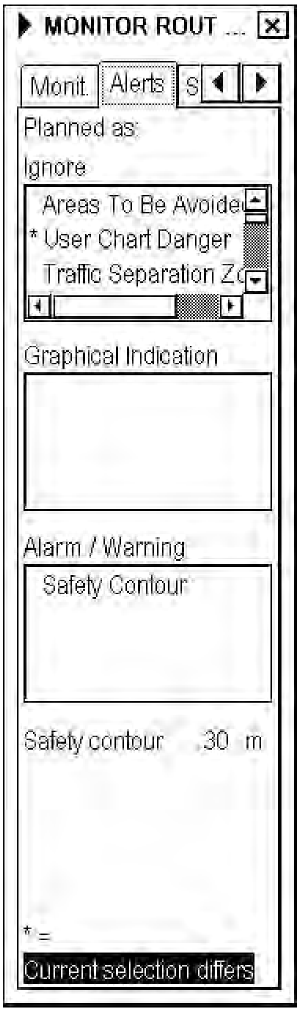
### How to select final waypoint

This selection is used ONLY when the last waypoint should be different than the one defined last in your route. If needed use the Monitor Route menu to select it.

### How to select confirm checked conditions of the route plan

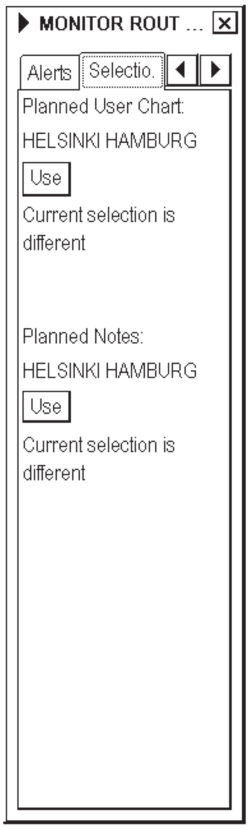
You can check on the Alerts page if checked conditions in the Alerts page are used with the route in route monitoring.

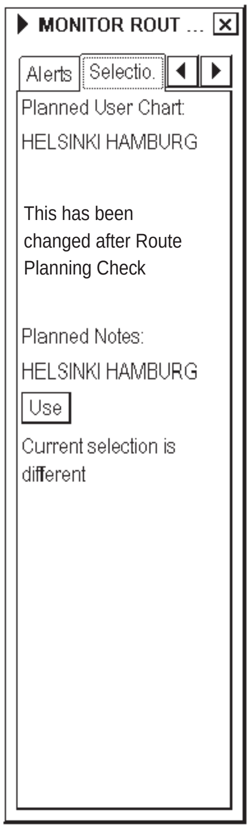
If the text "Current selection differ" is displayed, use Initial Settings>Chart Alert parameters to make "Chart alerts" selections.



### *How to use planned user chart*

To check if planned user chart is selected, open the Selections page in the Monitor Route menu to check that you have the correct user chart in the monitor mode.



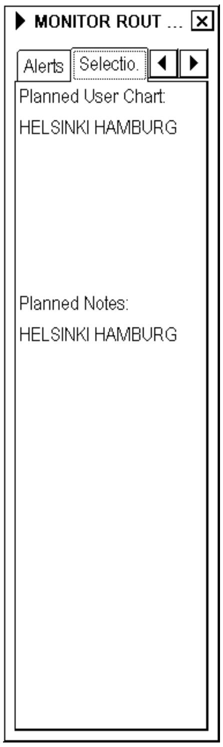




If the text "Current selection is different" is displayed, click the **Use** button to select user chart as monitor mode.

If the text "This has been changed after Route Planning Check" is displayed, re-check your route against chart alerts.

### *How to use planned Notes*

To check if planned Notes is selected, open the Selections page in the Monitor Route menu to check that you have correct Notes in the monitor mode.




If the text "Current selection is different" is displayed, click the **Use** button to select Notes as monitor mode.

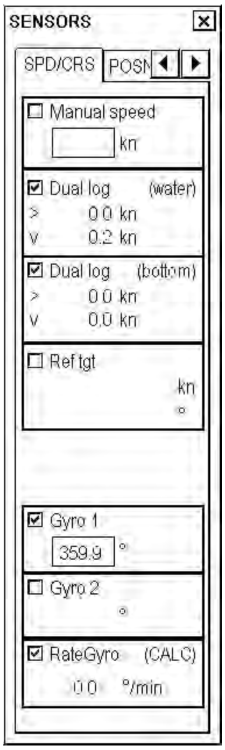
The text "This has been changed after Route Planning Check" reminds you that Notes has been modified after route planning check.

### 6.2.4 How to verify configuration of navigation sensors

The user can select navigation sensors for use in navigation and view their current values. There are "pages" for speed and course and position. The figure below shows the SPD/CRS page.

Checkbox status shows whether the sensor is used for integrated navigation or not. If there is no value shown for a sensor, it indicates that the sensor is not valid. Note that the content of these pages depends on the sensors that are in use on the ship.

To display the SENSORS dialog box, put the cursor on the position indication in the information area then push the right button.



### How to verify speed settings (SPD/CRS page)

Select both Log and Dual log, if they are available, or select one of them, on the SPD/CRS page.

Note that manual speed should only be used in an emergency, when no other speed reference is available. Remember that position sensors are also available as speed sources. If neither Log nor Dual log is available, you can use a Ref tgt as the source for speed and course.

### How to verify position sensors (POSN page)

On the POSN page of the SENSORS dialog box, the data field of a position sensor contains a label(s) (in the figure at right it is FURUNO and MX200) that indicates the type of the position sensor. Primary-Sec(ondary)-OFF indicates sensor status and priority. Position in local datum, speed and course are also shown. A DGPS position sensor also shows the text "Diff" if the differential signal is in use.

Position sensors have priority, which is indicated by Primary and Sec(ondary). Only one sensor can be primary while the others can be secondary or off position. After a sensor is turned off, its status is changed to Secondary state. When a position sensor state is changed to primary and another sensor was primary, the sensor formerly primary becomes secondary.

Select the "Primary" navigation sensor as the sensor that is considered to be most accurate and reliable. Set all other navigation sensors as "Secondary".

### V How to verify Kalman filter (POSN page)

The Kalman filter is an automatic process that will calculate the most probable position based on all position sensors. The filter uses in its process all sensors that are not selected to OFF. For more information about the Kalman Filter, see section 15.6 Kalman Filter.

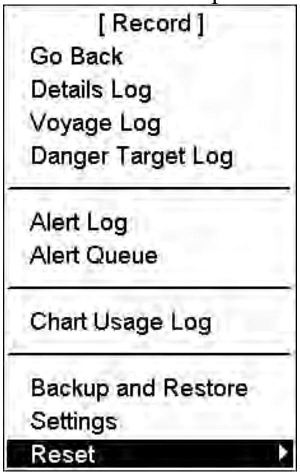
### How to verify alignment (POSN page)

The alignment is a correction given by the chart align function, and it is used to move the ship to the "correct" position. Normally turn this feature off in the start-up procedure. For more information about position alignment, see section 15.6.1 Position alignment.

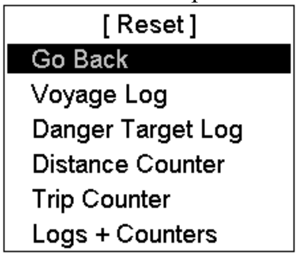
### 6.2.5 How to reset distance and trip counters

To reset the distance and trip counters to zero, do the following:

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Select Record then push the scrollwheel.




3. Select Reset then push the scrollwheel.



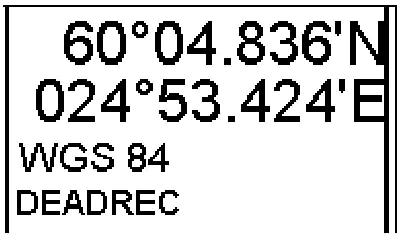

4. Select appropriate "Counter" item then push the scrollwheel. (The difference between Distance Counter and Trip Counter is distance counter is the total distance run and trip counter is the distance between random two points.)
5. You are then asked if you are sure to reset selected counter. Click the **OK** button to reset. The prompt window disappears.

### 6.2.6 How to verify datum

Datum is used to select between different models of the earth. It is essential that you use datum in a uniform way.

If you use paper charts together with electronic chart material, it is recommended that you use the same datum as your current paper chart to avoid misalignment between your electronic chart system and points taken or plotted on your current paper chart.

Once you have selected a datum, all numerical latitude-longitude position values are presented in your selected datum.




To change the datum:

1. Select the datum indication in the top box in the information area.
2. Spin the scrollwheel to select appropriate datum, the one that matches your paper charts, then push the scrollwheel.

# 7. Vector Charts

Theoretically a chart can be coded for use on a computer as a vector chart. Vector-coded charts are coded using a variety of techniques. One technique is called S57ed3 and it has been chosen by IMO as the only alternative for SOLAS compliant electronic charts. If an S57ed3-coded chart is published by a government-authorised Hydrographic Office, then it is called "ENC". You can read more about ENC and related legal issues in this chapter. Hereafter, all references to vector chart material are referred to as "S57 charts" regardless of their source.

Sometimes you can wish to manually add Notices to Mariners or Navtex warnings into your S57 charts. This is called "manual updates". Also, manual updates are valid for all scales so that you don't need to repeat them for charts published in different scales from the same area. For further details, see Chapter 8 Manual Updates.

## 7.1 S57 Charts

### 7.1.1 Introduction

An ENC could be encrypted to prevent unauthorised use so the user needs a permit to view the ENC. This permit could be entered manually from the control unit, loaded from a floppy disk or loaded through telecommunications from an RENC.

Before any ENC can be used in the chart radar, it is loaded into your hard disk and converted into the system's own internal format (SENC). Some parts of the charts may be date dependent, i.e., they are visible after a set date or they are visible only for a limited period, etc. In the electronic chart system, you control all date-dependent objects with Display Until and Approve Until dates. In the paper chart world, the Preliminary and Temporary Notices to Mariners represent the date dependency described above for S57 charts.

An important part of ENCs are the updates. Hydrographic Offices can issue two kinds of updates:

1. Incremental updates, which are small additions to original base cells.
2. Reissues and new editions, which are complete replacements of previous base cells and their updates.

All updates are date stamped and they may also contain date-dependent parts. You control usage of updates in the electronic chart system from Display Until and Approve Until dates. Using Display Until and Approve Until dates, you can view your charts correctly drawn on any date in the past or in the future.

Chart material will be stored in media such as CD ROMs and floppies, electronically through telecommunications from RENCs or electronically from LAN (Local Area Network) in which it could have arrived from RENCs, CD ROMs or floppies. Such material can contain only basic cells, cells and updates or only updates. The electronic chart system contains as standard the software required to access CD ROMs, floppies and LAN.

Each S57 chart may contain additional links to textual descriptions or pictures, besides the chart itself. Typically additional textual descriptions and pictures contain important sailing directions, tidal tables and other traditional paper chart features that do not have any other method to be included into the S57 chart. This chart radar copies these textual descriptions and pictures into its hard disk so the user may cursor-pick them for viewing purposes.

For how to interpret the S57 ENC chart display, see Appendix 2.

### *Definitions of terms*

***Cell*** A cell is a geographical area containing ENC data. Each cell has a separate unique name. Hydrographic Offices divide their responsibility area by the cells that they publish.

***S57 chart*** A database, standardized as to content, structure and format, is issued for use with chart radar without any authority of government-authorized Hydrographic Office.

***ENC*** A database, standardized as to content, structure and format, is issued for use with chart radar on the authority of government-authorized Hydrographic Offices. The ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g., sailing directions) that may be considered necessary for safe navigation. The name of the coding standard for ENC is S57ed3.

***SENC*** A database resulting from the transformation of the ENC by chart radar for appropriate use, updates to the ENC by appropriate means, and other data added by the mariner. It is this database that is actually accessed by the chart radar for display and other navigational functions. The SENC may also contain information from other sources.

***RENC*** A service provider offering ENC delivery and update service as defined in IHO standard S52e3. Often an RENC provides both CD ROM and telecommunications-based service to chart radar users. One example of an RENC is an RENC in Stavanger, Norway, operating under the marketing name PRIMAR.

## 7.1.2 Chart legend for S57 chart

The chart legend, which provides various data about the chart currently displayed, can be toggled on and off by placing the cursor in the sidebar, clicking the right button, choosing Chart Legend from the menu then pushing the scrollwheel.

This system is capable of showing more than one S57 chart at a time. This feature is called the multi-chart display. If one S57 chart does not cover the whole display, the system will open more S57 chart cells for display, if appropriate cells for the displayed area are available. The chart legend shows information about S57 charts displayed on the electronic chart display area. The information is displayed with reference to own ship position if automatic TM reset is active, or with reference to the current position of the cursor if automatic TM reset is OFF.

S57 chart legend

| | |
|---|---|
| Cell name | FI4EIIQR |
| Navigational purpose | Approach |
| Issue date | 20010201 |
| Edition number | 1 |
| Last displayed update | 019 |
| Update issue date | 20010724 |
| Last update appl. date | 20010201 |
| Projection | Mercator |
| Horizontal datum | WGS 84 |
| Vertical datum | Approximate mean sea level |
| Sounding datum | Mean lower low water springs |
| Quality of data | Zone of confidence A1 |
| Magnetic var. | |
| Depth | metres |
| Height | metres |

**Cell name:** Name of chart.

**Navigational purpose:** S57 charts are compiled for a variety of navigational purposes. The navigational purpose, for which an individual S57 chart has been compiled by a Hydrographic Office, is indicated in this field. Alternatives are: Overview, General, Coastal, Approach, Harbour and Berthing.

**Issue date:** Issue date of the base cell of the chart.

**Edition number:** Edition number of the chart.

**Last displayed update:** Number of last update, which is visible on the chart screen.

**Update issue date:** Issue date of last update, which is visible on the chart screen.

**Last update appl. date:** Date to which the last update, which is visible on the chart screen, is effective.

**Projection:** Projection of the chart. The projection is always Mercator.

**Horizontal datum:** Horizontal datum of the chart data as published by the chart producer. By definition this must be WGS 84.

**Vertical datum:** Vertical datum of the chart.

**Sounding datum:** Datum used for soundings.

**Quality of data:** Quantitative estimate of the accuracy of chart features, given by the chart producer.

**Magnetic var.:** Amount of magnetic variation. A positive value indicates a change in an easterly direction and a negative value indicates a change in a westerly direction.

**Depth:** Unit of measurement for depth.

**Height:** Unit of measurement for height above sea level (for example, clearance height).

### 7.1.3 Permanent messages for S57 charts

Permanent messages help you keep the S57 charts up-to-date and these are shown at the top left corner on the screen. Permanent messages appear if the system detects a condition that may cause a chart to be not up-to-date.

**Note:** The system can assist in keeping RENC-received charts up-to-date. For charts that have been loaded from sources other than an RENC, the system is unable to know the exact up-to-date situation.

For further details see section 7.11 Chart Viewing Dates and Seasonal Features of the Vector Chart.

> **Permanent Message**
> At least one of used charts has more than 1 week between "Approved Until" and/or "Displayed Until" and current system date Use Chart Menu - Set Chart viewing dates

You have loaded updates into your hard disk, but these updates are not included in the SENC. The name of the chart appears in orange in the chart catalogue.

Perform SENC conversion for these charts. For SENC conversion, see section 7.3.6 How to use the SENC CONVERT window to initiate SENC conversion.

> **Permanent message**
> At least one of used charts is not up-to-date. At least one update is loaded in hard disk, but not in SENC.
> Use Chart Menu - Set Chart viewing dates to check charts.

For further details, see section 7.6.3 How to find up-to-date status of an RENC product list.

> **Permanent Message**
> SSE 27 At least one of used charts is not up-to-date Get or load latest updates from your RENC service Use Chart Menu - Set Chart viewing dates to check charts

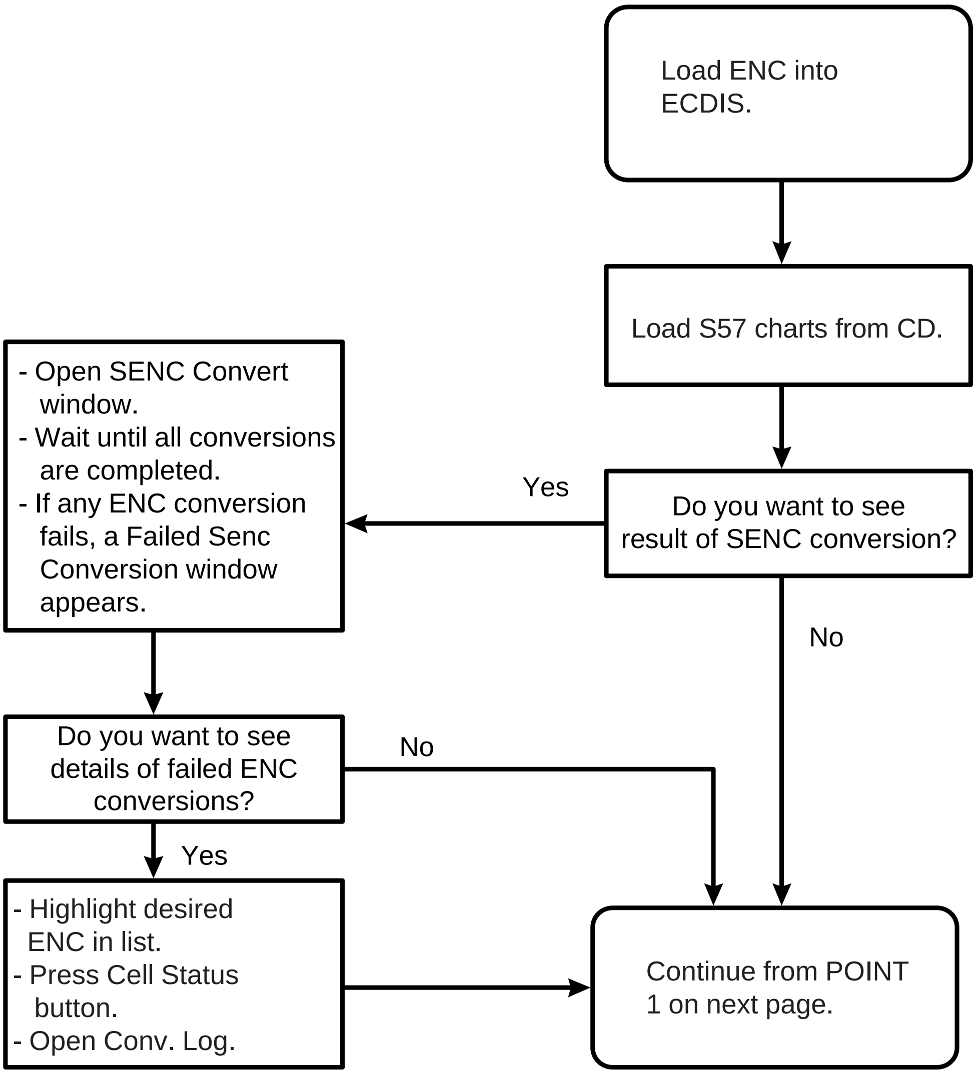
You have loaded an update that contained cancel information for a chart, and you have chosen not to remove the cancelled chart. This permanent indication reminds you about your intended use of a cancelled chart.

Consider removing the chart. For information on how to remove S57 charts, see section 7.4.5 How to remove an S57 chart cell from the system.

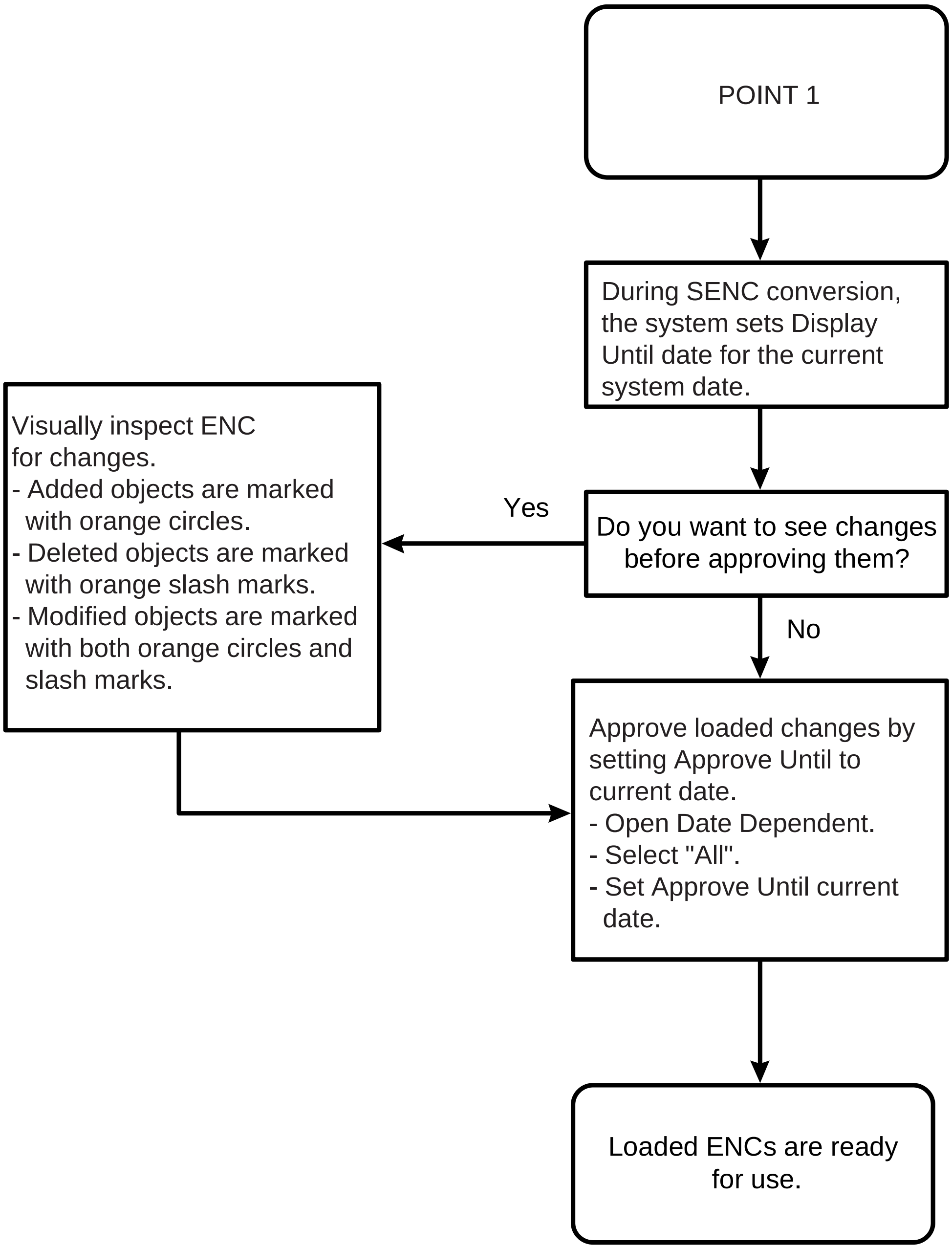
> **Permanent message**
> At least one of used charts is canceled.
> Use Chart Menu - Catalogue to check charts.
> Use Chart Menu - Remove to remove canceled charts.

# 7.2 How to Load S57 Charts

## 7.2.1 Flow chart for how to load S57 charts into chart radar




*Data flow chart, How to load S57 charts into chart radar*



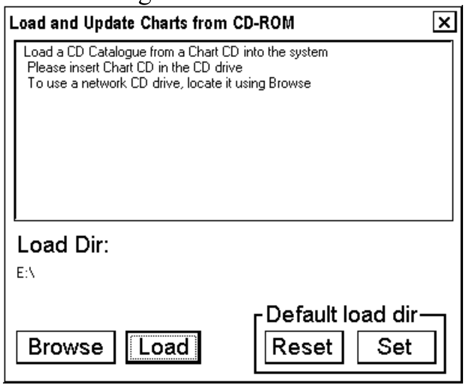

*How to load S57 charts into chart radar (continued)*

### 7.2.2 How to load S57 charts from a CD ROM, floppy disk or LAN

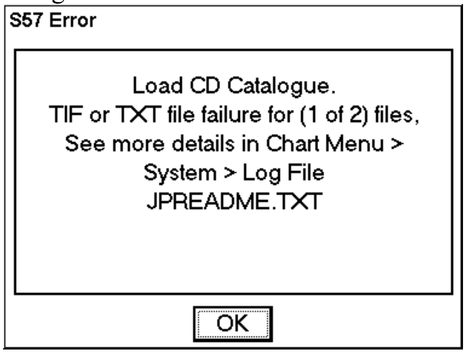
When you load S57 charts by CD ROM catalogue, the system first loads a CD ROM catalogue, which stores certain information into your hard disk such as cell IDs, their position, and edition number, from your LAN (Local Area Network) connection, floppy disk or CD ROM. Then, the system asks which charts you want to load from the chosen media. After building the CD ROM catalogue, you can view the contents of it by using the Chart Catalogue command in the Chart menu.

To load by CD ROM catalogue, do the following:

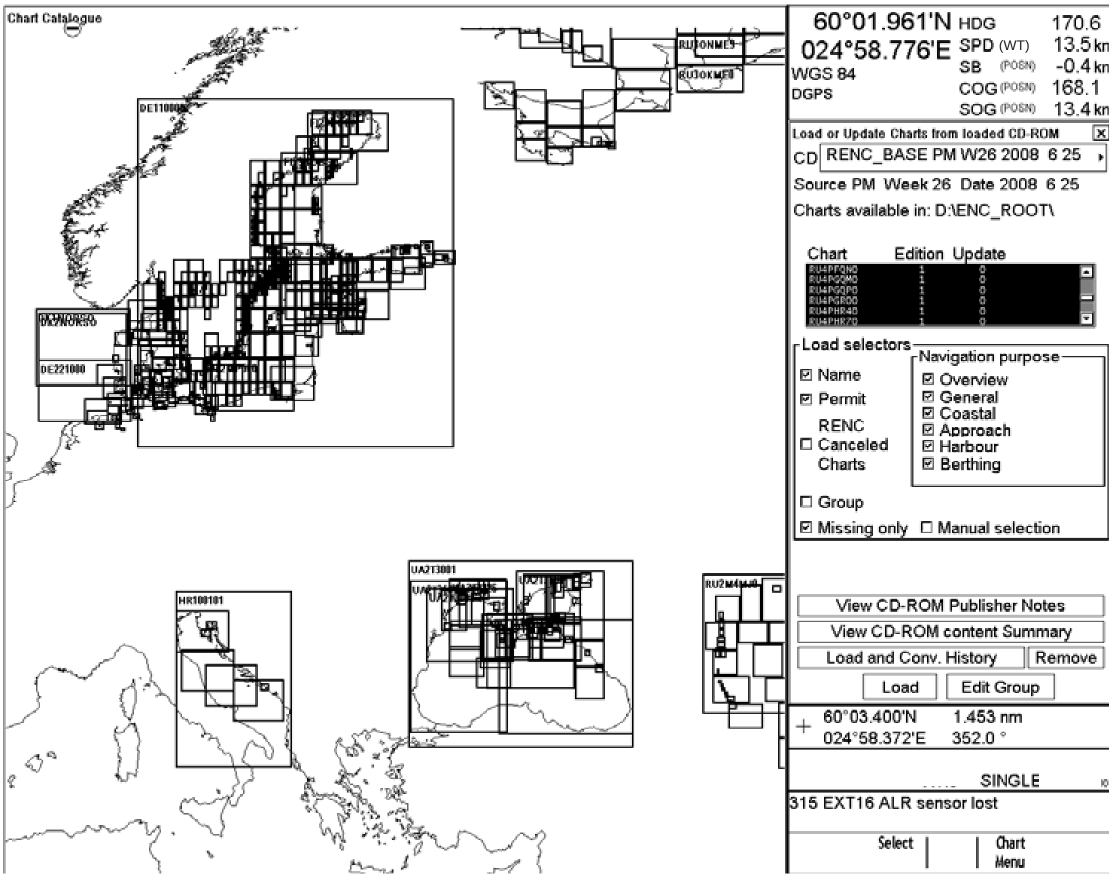
1. Insert CD ROM or floppy disk in respective drive. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the right button.
2. Choose Load and Update Charts from the menu and "from CD ROM" from the sub menu (see bottom figure at left). The default load source is from CD ROM.
3. Click the **Load** button to load from a CD ROM. If you want to load from another chart radar using LAN, you have to change Load Dir. Click the **Browse** button to choose a new Load Dir.



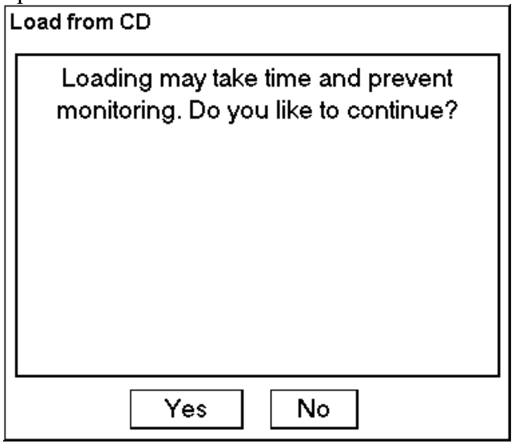

4. The chart radar loads content summary and Product List from the CD ROM then opens the Load or Update Charts from CD ROM dialog box.
5. The system automatically copies all text and pictures files associated with charts from the CD ROM catalogue. The system keeps only the latest version of these. If your system already has newer text or pictures in use, you will get the notice below.



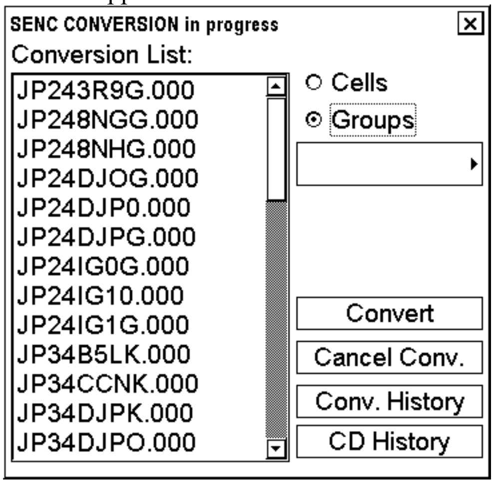
5. In the Load or Update Charts from loaded CD ROM dialog box, you choose the charts to load into the chart radar. Then, click the **Load** button to load those charts. See also "Interpretation of Load or Update Charts from loaded CD ROM dialog box" on page 7-8.



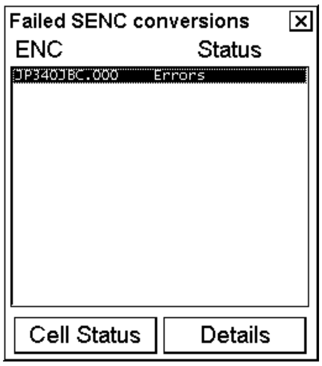

6. Before loading starts (then automatically converts them into SENC format) you are asked to confirm this operation.



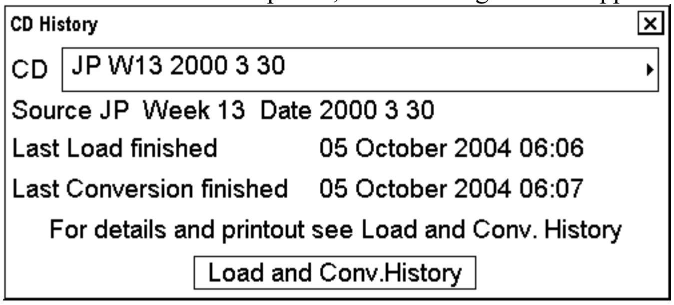
7. Click the **Yes** button. Charts are then loaded and automatically converted to SENC format. The SENC Convert window appears.




If an error is detected during conversion from ENC to SENC, the following window appears. To find the reason click the **Details** button.



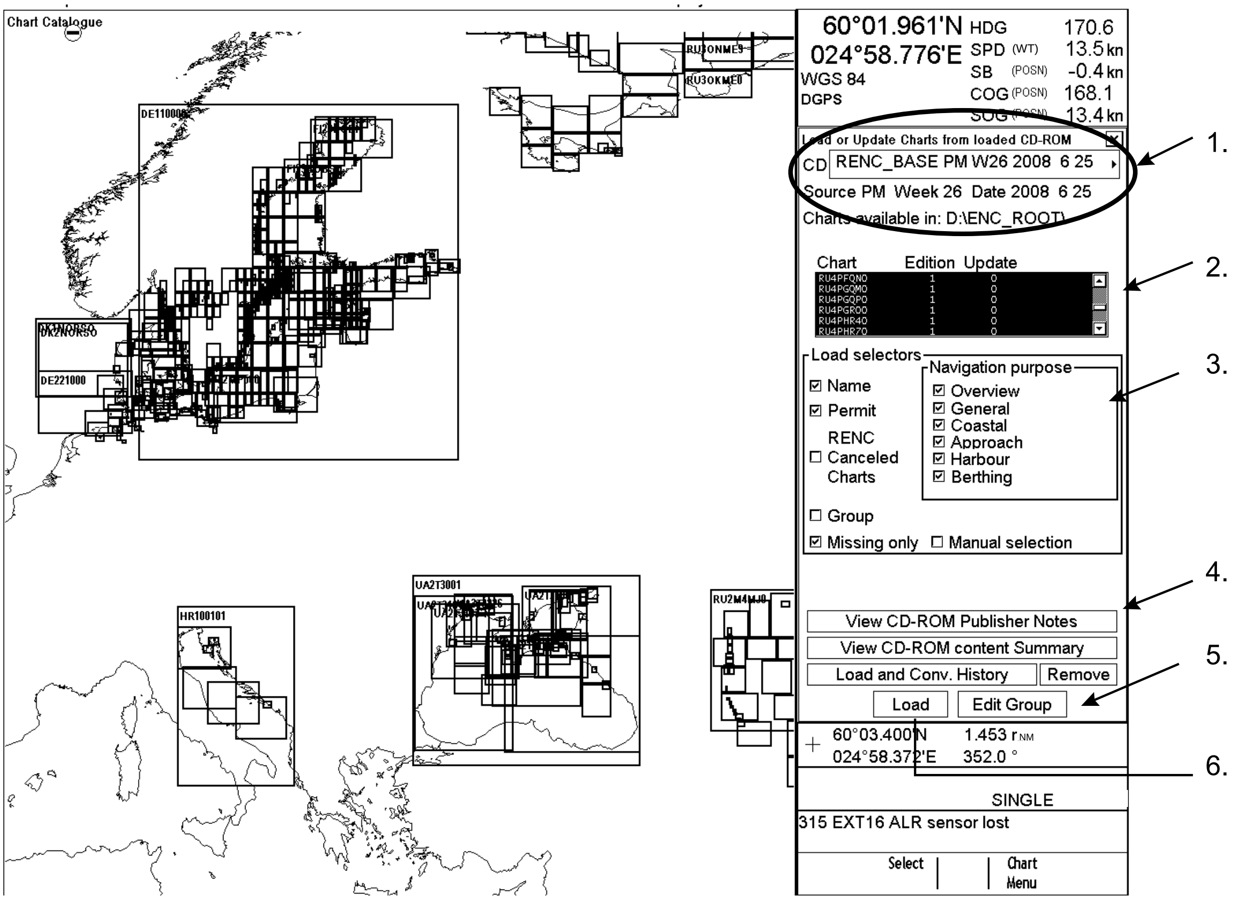

8. When conversion is completed, the following window appears.




9. Click the X button to close the window.

### *Interpretation of Load or Update Charts from loaded CD-ROM dialog box*

This window provides information about the loaded CD-ROM. To display this window, open the Chart Menu and choose Load and Update Charts from the menu and "from CD-ROM" from the sub menu.




1. The source and edition date of the chart radar are displayed here.
2. A list of charts stored in the CD-ROM, edition number of the chart and the number of updates included in the chart.
3. In the **Load Selector** field, you can choose how to pick desired charts from the list:
   - **Name:** Chart names are displayed on graphical presentation if selected.
   - **Permit:** Available charts will be highlighted in the CD-ROM and for which you have permits.
   - **RENC Canceled Charts:** The system will display the charts that are canceled on RENC and normally on CD-ROM.
   - **Group:** If you have predefined a group of charts the system will highlight those charts in the group that are available in the CD-ROM.
   - **Manual Selection:** You can highlight desired charts from the list.
   - **Missing only:** Loads and display on graphical presentation only charts and their updates that are not already loaded.
4. Other buttons:
   **View CD-ROM Publisher Notes**: View important notices published by chart producer
   **View CD-ROM content Summary**: Provides a list of the charts on the CD ROM that can be used.
   **Load and Conv. History:** Displays the charts on the CD-ROM that have been loaded and converted.
   **Remove:** Remove CD-ROM catalog from this system.
5. The **Edit Group** button is used to create and modify a group.
6. The **Load** button is used to start loading.

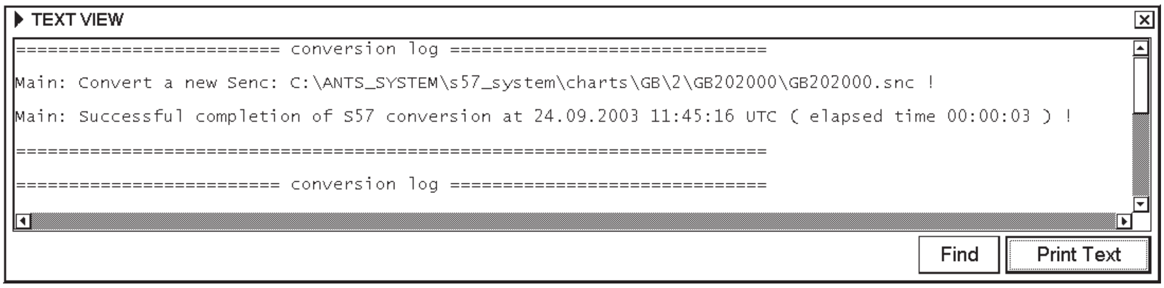
7. The **Edit Group** button is used to create and modify group.

6. The **Load** button is used to start loading.

**Note 1:** The system can convert into SENC and set the "Display Until" date automatically. This is the recommended way. For how to do this, see section 7.3.2 How to select automatic SENC conversion and display until date.

**Note 2:** You should read the text file associated with each catalogue. The text file typically contains **very important notices for the usage of the charts from the producing Hydrographic Office**.

1. Click the **View CD ROM Publisher Notes** button in the Load or Update Charts from loaded CD ROM dialog box (see previous page)




2. To close this window, click the Close window button(X) at the upper right corner of the window. You can view the summary of the contents of the CD ROM. It contains information about charts you are going to load.
3. Click the **View CD ROM content Summary** button on the S57 load window. Data for the selected CD-ROM is displayed.

   **Cell ID:** Name of the chart

   **Edition:** Edition number of the chart

   **Base:** Including update number and issue date of base cell of the chart

   **First Update:** Update number and issue date of the first update included

   **Last Update:** Update number and issue date of the last update included
4. If you want to make a hard copy of the Content Summary, hit the **Print Text** button.
5. To close this window, click the Close window button (X) at the upper right corner of the window.

### *How to view load and conversion history of CD ROM*

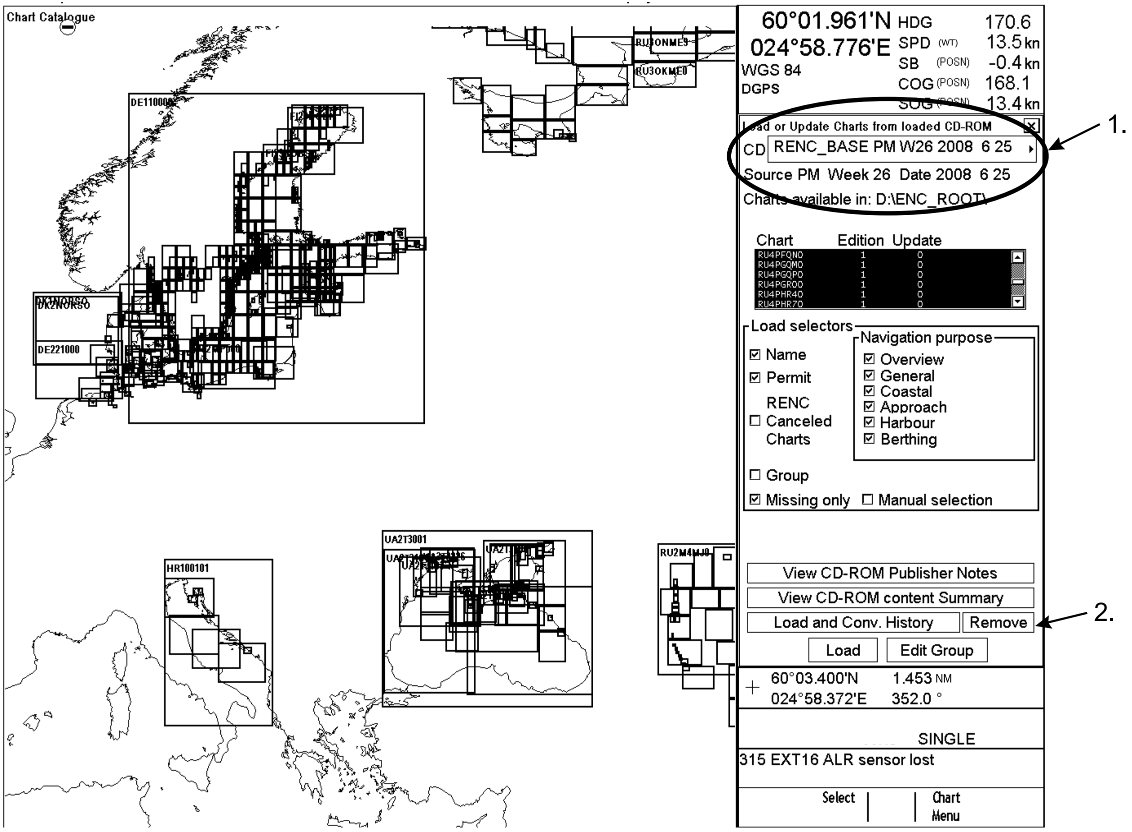
You can view what is loaded and converted from a CD ROM by using Load and Conv. History, which is in the Load or update Charts from CD ROM dialog box.

1. Show the Load or Update Charts from loaded CD ROM dialog box.
2. Choose desired CD ROM from the list of CD ROMs.
3. Click the **Load and Conv. History** button, and window that looks something like the one below appears.

From the list you can verify which charts are already loaded and converted from the CD ROM.

### *How to remove an unnecessary CD ROM catalogue*

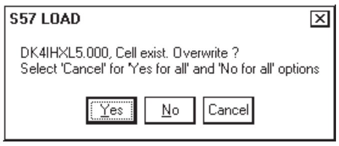
If you have unnecessary CD ROM catalogues in your CD ROM list, you can remove them as follows:

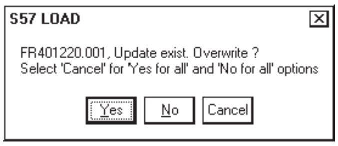


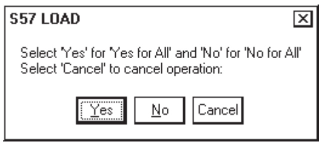

1. Show the Load or Update Charts from loaded CD ROM dialog box. Choose desired CD ROM.
2. Use the **Remove** button to permanently remove chosen CD ROM catalogue.

### *Messages that control reload*

If you try to load charts with the same edition already loaded into your hard disk or if you try to load the same update already loaded into your hard disk, you get the following messages after clicking the **Load** button.



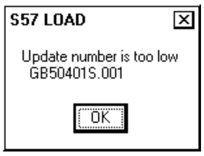

If you want to avoid the very time consuming task of reloading charts that you already have, then you should choose **No** (="No for all" option in above window). However if you want to reload charts, then choose **Yes** (="Yes for all" option in above window).

### *Messages that contain only notice*

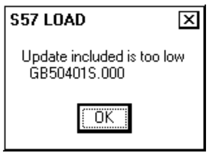
If you tried to load chart data that is older than you already have in your hard disk, you will get one of the following messages:

This indicates that you are using a newer edition of the chart mentioned in the box.

This indicates that you are using a newer reissue of the chart mentioned in the box, which includes this update.




This indicates that you are using a newer reissue of the chart mentioned in the box.




This indicates that you are using the updates mentioned in the box.

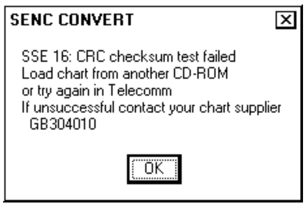
**Note:** You cannot replace chart data that is already in use unless you only replace the latest base cell or update. If you want to reload older data again, you must first remove the corresponding chart from your hard disk. For further details, see section 7.4.5 How to remove an S57 chart cell from the system.

### *Messages that require careful attention*

All messages in this chapter change the legal status of the charts in your system.

#### Test before ENC to SENC conversion fails

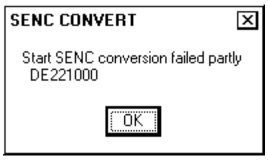
CRC checksum is tested before the SENC conversion and if it fails you get this message.




#### Conversion from ENC to SENC fails partly

Conversion failed partly due to internal booking error of the chart.

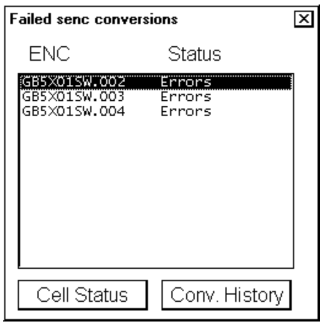
Load the chart and updates again into the system.




#### ENC to SENC conversion fails or detects errors

If the SENC conversions detect anything abnormal, you get the following message window:

For further details, see section 7.3 S57 SENC Conversion Details.



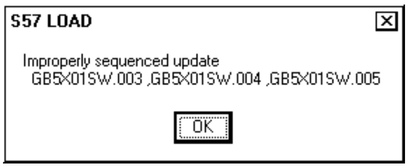

#### A new edition of the chart has been published and you missed it

If you tried to load updates for a chart for which you do not have new enough base cells or reissues in your hard disk, you will get following message:

The message above clearly indicates that this chart is not up-to-date and thus it does not fulfil SOLAS requirements. Get the latest edition of the chart from the publisher immediately.

## You do not have all the published updates

If you tried to load updates and you missed one or more updates between updates already loaded into your hard disk and the updates that you are loading, then you get following message:

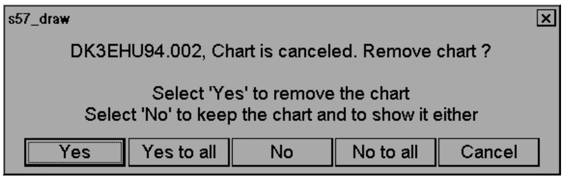



The message above indicates that you tried to load update numbers 3, 4 and 5 when at least update 2 and possibly update 1 were not available in your hard disk. Check the content of your CD ROMs to find the missing update/updates or contact your chart supplier.

The message above clearly indicates that this chart is not up-to-date and thus it does not fulfil SOLAS requirements. Get the latest edition of the chart from the publisher immediately.

## Unsafe chart has been cancelled by the publisher

If you load an update that contains instructions from the publisher to cancel the chart, you get following message:




Normally, you should accept the cancellation by clicking the **Yes** button. Then the system automatically removes the chart from the hard disk and from your chart screen.

You can elect to keep the chart although the publisher of it has told you that the content of the chart is unsafe for use in navigation. The reason might be that you do not have anything better available. In this case, click the **No** button. Then the system automatically removes the ENC status from the chart, because the publisher has told so in his special cancellation update.

Note that the cancellation message above clearly indicates that the publisher says that this chart is unsafe for navigation and thus it does not fulfil SOLAS requirements. Get the latest edition of the chart from the publisher immediately to replace the unsafe cancelled chart.

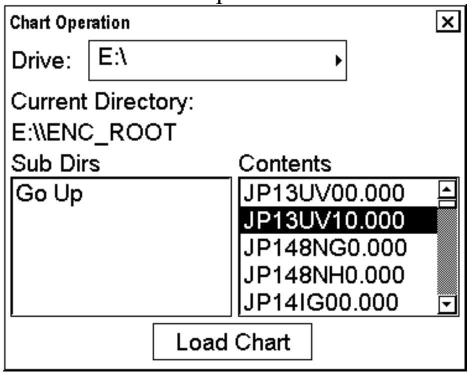
### 7.2.3 How to load S57 charts that are not fully compliant with the IMO standards

The chart radar could in some cases load S57 charts that do not have full compliance with S57 standard coding for transfer media. Minimum requirements for loading manually is legally coded:

- XXXXXXXX.000 file, which includes a base cell.
- XXXXXXXX.NNN file, in which NNN is a number from 001 to 999, and which includes an update.

To load charts without building a named "CD ROM catalogue" do the following:

1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area then push the right button.
2. Choose Load and Update Charts from the menu and Manual from the sub menu.




3. Select desired drive and charts.
4. When you are ready to load charts, click the **Load Chart** button.
5. The system may also make conversion into the SENC and setting of Display Until date automatically if you have set up for them. This can take a few minutes.

## 7.3 S57 SENC Conversion Details

S57 charts from Hydrographic Offices are called ENCs. An ENC has to be converted into SENC format before it can be used in the chart radar. The chart radar can convert ENC into SENC format automatically. If the conversion is successful, the Failed SENC conversion window does not appear.

If the system fails to convert ENC into SENC or if the system detects a coding error in an ENC, the Failed SENC conversion window appears with a list of failed ENCs. In this window you can choose any of the charts to see the reason for failure in conversion.

Normally the conversion is initiated automatically when a chart is loaded. Section 7.2 How to Load S57 Charts describes the loading process. Section 7.3.2 How to select automatic SENC conversion and display until date describes how to choose automatic conversion. You can also initiate conversion from The SENC Convert window or from a cell status window.

### 7.3.1 How to speed up SENC conversion

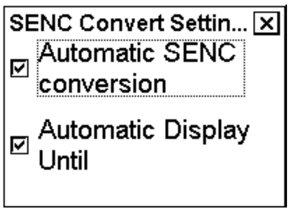
The SENC conversion speed depends about how many other tasks the system is occupied with. The system can conduct SENC conversion in the background during any other system operations, but you can greatly lessen the time for SENC conversion by doing the following:

1. Disable the radar.
   a) Spin the scrollwheel to display Chart Display/Info/Standard Display in the guidance area then push the left button.
   b) Click the right arrow tab to display the Standard page.
   c) Uncheck Radar.
   d) Click the X at the top right corner of the window to close the window.
2. Choose display mode (upper left corner on the status bar) as True Motion.
3. Spin the scrollwheel to display Set Chart Center/Info/Active Scroll in the guidance area then push the left button. Set chart center so ship is off the screen or TM reset is OFF.
4. Set the scale to 1:1,000 by displaying Range+/ /Range- in the guidance area then pushing the appropriate button to display 1:1,000.

### 7.3.2 How to select automatic SENC conversion and display until date

When you are loading new S57 charts base cells and/or their updates into your hard disk, they can be automatically converted to SENC format. Further, display dates can be set as issue dates automatically. Do the following to set these options:

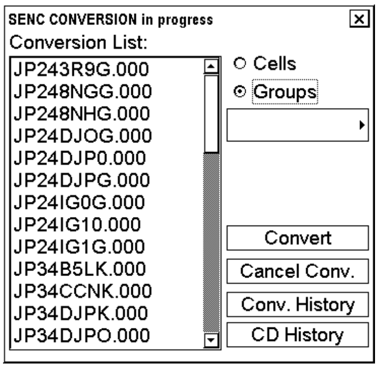
1. Spin the scrollwheel to display Menu/Info/Chart Menu in the mouse function area then push the right button.
2. Choose System > SENC Convert Settings from the menu then push the scrollwheel. The SENC Convert Settings dialog box appears.
3. Check Automatic SENC conversion and Automatic Display Until.
4. Click the X at the top of the dialog box to close the box.




### 7.3.3 How to view progress of SENC conversion

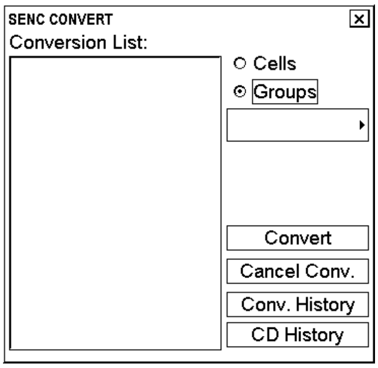
If you want to view the progress of SENC conversion, display the SENC Convert window as follows:

1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area then push the right button.
2. Choose SENC Convert from the menu then push the scrollwheel. The SENC Convert window appears.

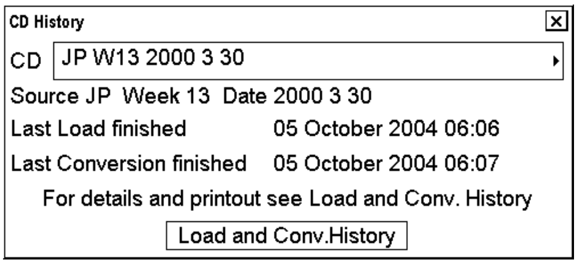



The example above shows a queue of unfinished SENC conversions.

**Note:** You can remove charts from the conversion list at any time. Use the cursor to highlight desired amount of chart names in the Conversion List. Then, click the **Cancel Conv.** button to remove those charts from the SENC conversion queue.




The example above shows that all SENC conversions have been finished. Then, you can see CD ROM history by clicking the **CD History** button. You can view the results of the finished SENC conversions by clicking the **Load and Conv. History** button.



### 7.3.4 How to use the Failed SENC conversion window

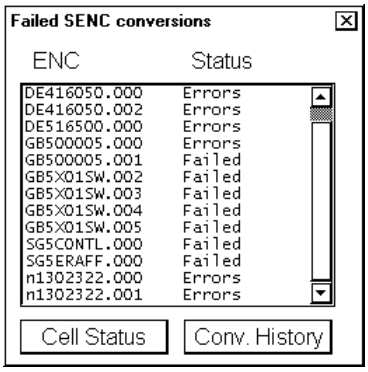
If the system is unable to convert ENC into SENC without any error or failure, the Failed SENC conversion window appears with a list of failed ENCs. Status of Failure means that the system completely failed to convert the ENC into the SENC and thus the ENC cannot be used.

Status of Errors means that the system detected minor or major errors in the conversion of the ENC into the SENC. Check the content of Conv. History and cell status to see if the error was minor or major. Major errors are indicated as NON ENC in Conv. History. Note that the status of errors together with NON ENC in Conv History clearly indicate that this chart is not up-to-date and thus it does not fulfil SOLAS requirements. Get the latest edition of this chart from the publisher immediately.

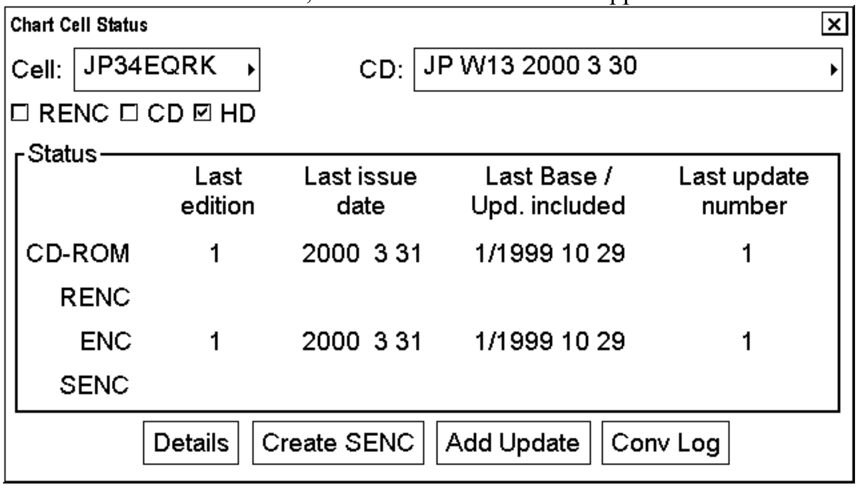
"Failed" means that the system completely failed to convert the ENC into the SENC and thus the ENC cannot be used**.** Failure clearly indicates that this chart is not up-to-date and thus it does not fulfil SOLAS requirements. Get the latest edition of this chart from the publisher immediately.

The Failed SENC conversion window contains two buttons. **Conv. History** opens the conversion history log and **Cell Status** opens the window of chosen item in the list of Failed SENC conversions window.

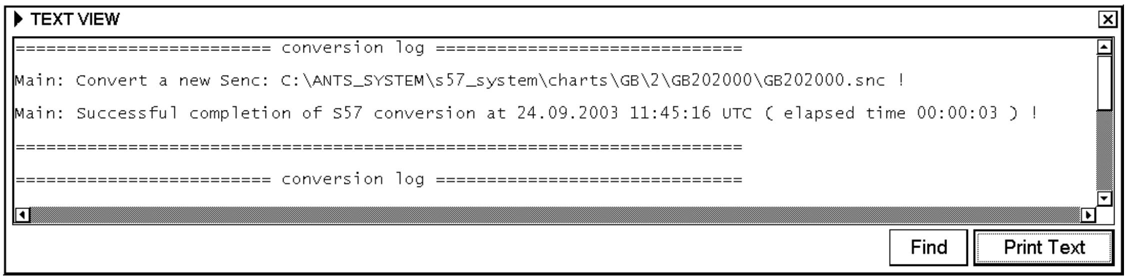
The **Conv. History** button is used to display the conversion log. The conversion log shows the status of converted ENCs. For further details about the results of conversions, see section 7.3.5 How to use the SENC conversion history log.




Click the **Cell Status** button, and a Cell Status window appears.



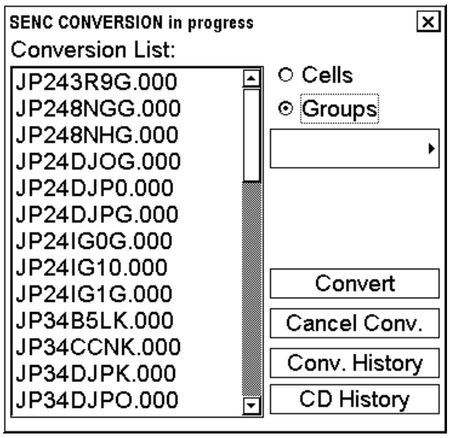

Then you can click the **Conv Log** button to view a detailed description of errors and failures detected during SENC conversion (see example below).



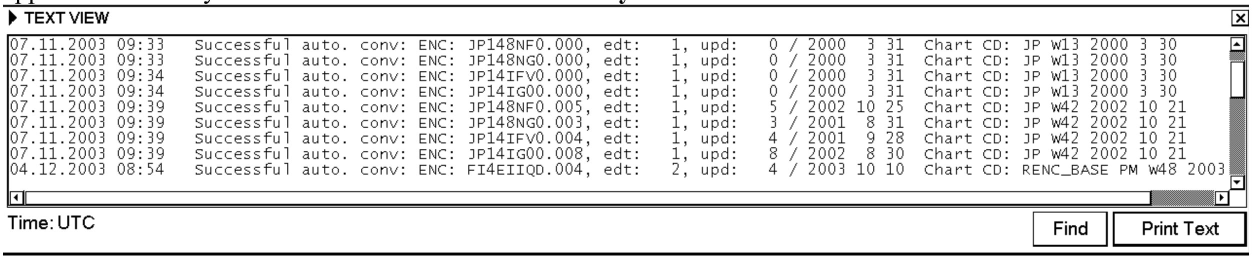
### 7.3.5 How to use the SENC conversion history log

The system automatically records the results of all conversions into the conversion history log. You can view the content of this log at any time by doing the following:

1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area then push the right button.
2. Choose SENC Convert from the menu then push the scrollwheel. The SENC Convert window appears.




3. After conversion (Conversion list becomes empty), click the **Conv. History** button. A list of converted charts appears. Note that you can also activate the **Conv. History** from the "Failed SENC conversions" window.




You can view the status of converted charts on the list, and also source if it is available.

4. Click the X at top right corner to close the window.

Below are examples of all possible results of conversion:

#### *Perfect chart*

`Successful auto. conv: ENC: GB203000.000, edt:  1, upd:  0 / 1999 4 3`

#### *Perfect chart that is produced by a private chart producer (i.e., chart doesn't have ENC status)*

A private chart cannot fulfil SOLAS requirements

`Successful auto. conv: ENC: AS31MATT.000, edt:  1, upd:  0 / 1999 4 8 NON E`

#### *Conversion errors, but the chart is partly usable*

Use cell status to check details of errors. Note that the chart is still ENC.

`Successful auto. conv with errors: ENCD ROME416050.000, edt:  3, upd:  0 / 1998 6 12`

#### *Conversion errors, but the chart is partly usable as NON ENC*

Use cell status to check details of errors. Note that the chart is no longer ENC if it was produced by a Hydrographic Office.

`Successful auto. conv with errors: ENC: n1302322.000, edt:  1, upd:  0 / 1999 1 4 NON ENC`

#### *Failed conversion*

Chart is not usable and you cannot view the chart.

`Failed automatic conversion: ENCD ROMK3EI0XE.000, edt:  1, upd:  0 / 1999 2 17`

### *Failed conversion of an update*

Chart is partly usable, but it is not up-to-date and you need the latest edition of the chart from its publisher. Note that the chart is still ENC, but it no longer fulfils the SOLAS requirement..

```
Failed auto. conv: ENC: GB500005.001, edt:  2, upd:  1 / 1997 9 26 Updating impossible before
new edition of base cell
```

### *Failed conversion. Checksum is not correct*

Chart is not usable and you cannot view it. Try to reload the base cell or update from the original media. And if that doesn't work order a new CD ROM from your chart supplier.

```
Failed automatic conversion: ENC: SG5CONTL.000, edt:  1, upd:  0 / 1996 2 25 CHECKSUM ERROR
```

### *Failed conversion. Checksum of an update is not correct*

Chart is partly usable, but it is not up-to-date. Try to reload the update from the original media. And if that doesn't work order a new CD ROM from your chart supplier. Note that the chart is still ENC, but it no longer fulfils the SOLAS requirement.

```
Failed automatic conversion: ENC: GB5X01SW.002, edt:  1, upd:  2 / 2005 1 1 CHECKSUM ERROR
```

### *Failed conversion. At least one of the previous updates has failed in its SENC conversion*

The system cannot accept additional updates unless all previous updates have been successfully converted into the SENC. Chart is partly usable, but it is not up-to-date. Try to reload the failed previous update from the original media (in this example the failed previous update is GB5X01SW.002). And if that doesn't work, order a new CD ROM from your chart supplier. Note that the chart is still ENC, but it no longer fulfils the SOLAS requirement.

```
Failed automatic conversion: ENC: GB5X01SW.003, edt:  1, upd:  3 / 2005 9 8 PREVIOUS Update
MISSING
```

### *Failed conversion. The base cell has failed in its SENC conversion*

The system cannot accept updates unless the base cell has been successfully converted into the SENC. Chart is not usable and you cannot view it. Try to reload the base cell from the original media (in this example the failed base cell is GB5X01SW.000). And if that doesn't work, order a new CD ROM from your chart supplier.

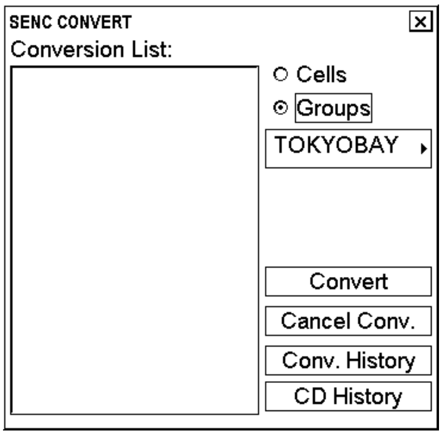
```
Failed automatic conversion: ENC: GB5X01SW.001, edt:  1, upd:  1 / 1998 9 8 PREVIOUS Base CELL
OR Update MISSING
```

### 7.3.6 How to use the SENC CONVERT window to initiate SENC conversion

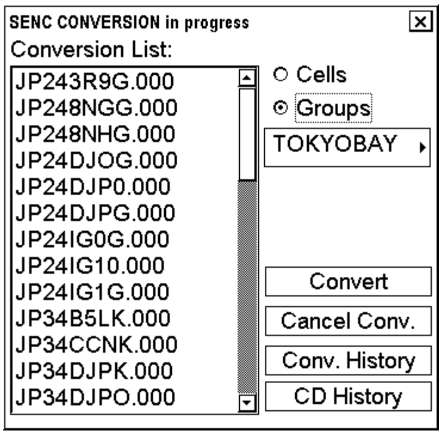
Normally automatic SENC conversion is chosen and there is no need to initiate SENC conversions from the SENC convert window. If you do not use the automatic SENC conversion, you need to manually initiate SENC conversion. Another case in which you need to manually initiate SENC conversion is if you upgraded or reloaded the chart radar software from the chart radar software CD ROM.

To initiate SENC conversions manually, do the following:

1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area then push the right button.
2. Choose SENC Convert from the menu then push the scrollwheel. The SENC Convert window appears.




3. Use the **Cells** button to choose an individual chart or use the **Groups** button to choose a group of charts.
4. Click the **Convert** button to initiate the SENC conversion of the charts.
   Note that Convert only converts those charts that are not currently converted into the SENC format. If your chosen chart or all members of your chosen group are already in the SENC format, the Conversion list remains empty. If all or some charts are not yet in the SENC format, they are added to the Conversion list (see the example below). If, for some reason, you need to force SENC conversion of an already converted chart, refer to section 7.14 Other Features of Vector Charts.



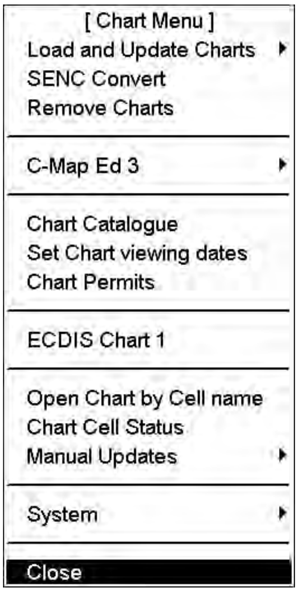

**Note 1:** You can remove charts from the conversion list at any time. Use the cursor to highlight the charts to remove then click the **Select** button. Finally, click the **Cancel Conv.** button to remove chosen charts from the SENC conversion queue.

**Note 2:** You can view the results of the finished SENC conversions at any time. Click the **Conv. History** button to view the conversion log.

# 7.4 Features of the Chart Menu

## 7.4.1 Overview of the chart menu

The Chart menu provides various features for processing charts. To display the menu, spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area then push the right button.




**Load and Update Charts:** You can load ENCs into your hard disk, using CD ROMs, floppies or LAN (Local Area Network). For further details see section 7.2 How to Load S57 Charts.

**SENC Convert:** You can convert ENCs (base cells and/or updates) into the SENC format by individual cell or by groups of cells. For further details, see section 7.3.6 How to use the SENC CONVERT window to initiate SENC conversion.

**Remove Charts:** You can remove cells from your hard disk. See section 7.4.5 How to remove an S57 chart cell from the system.

**Chart Catalogue:** You can manage S57 charts. See section 7.4.2 Catalogue of S57 cells.

**Set Chart viewing dates:** You can view date dependency of the cells (RENC status query date, number of updates available, update display dates, update approve dates of the cells) in the SENC format. For more information, see section 7.11 Chart Viewing Dates and Seasonal Features of the Vector Chart.

**Chart Permits:** You can load permits for encrypted charts to enable their use in your chart radar. Currently PRIMAR uses encryption.

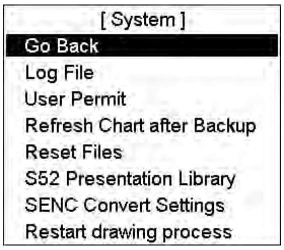
**ECDIS Chart 1:** This is used to open the chart set "IHO ECDIS Chart 1". This function helps you familiarize yourself with the various chart symbologies used with the chart radar. For detailed information, see section 7.12 Symbology Used in Vector Charts.

**Open Chart by Cell name:** You can open a S57 chart by its number. See section 7.9.2 How to select a chart by its name.

**Chart Cell Status:** You can view status of the cells (edition number and date, number of updates of the cell) stored in your hard disk, CD ROMs or RENC. You can compare that you have the latest cell with latest update in use. For further details, see section 7.14 Other Features of Vector Charts.

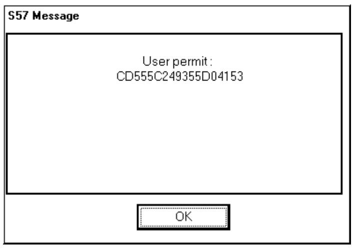
**Manual Updates:** You can update your charts manually. For the procedure, see Chapter 8 Manual Updates.

**System:** System contains a set of additional selections, and they are described below.



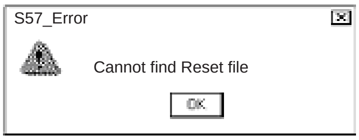

***Log File:*** The log file contains various system events that might be useful when your system supplier tries to find the reason for unexpected behavior of the system reported by you.

***User Permit*:** You can check your user permit, which is used as your identifier in security systems such as PRIMAR and CMAP. See the example at right.

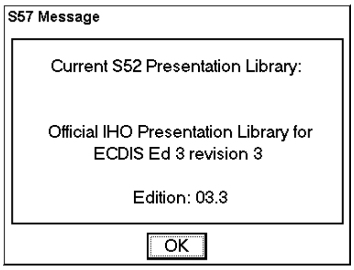



***Refresh Chart After Backup:*** This is used to refresh available charts and updates after someone backs up all charts and updates from another chart radar to this chart radar.

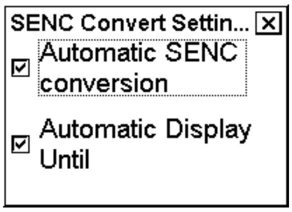
***Reset Files:*** This feature demonstrates chart uploading and downloading, and is for factory-use. If you accidentally choose this option, you get the message box shown right. Click the **OK** button to escape.




***S52 Presentation Library*:** You can confirm the S52 presentation library revision number for S57 charts. The current official Presentation library is shown in this example.




***SENC Convert Settings:*** Enable or disable automatic SENC conversion, automatic display until.



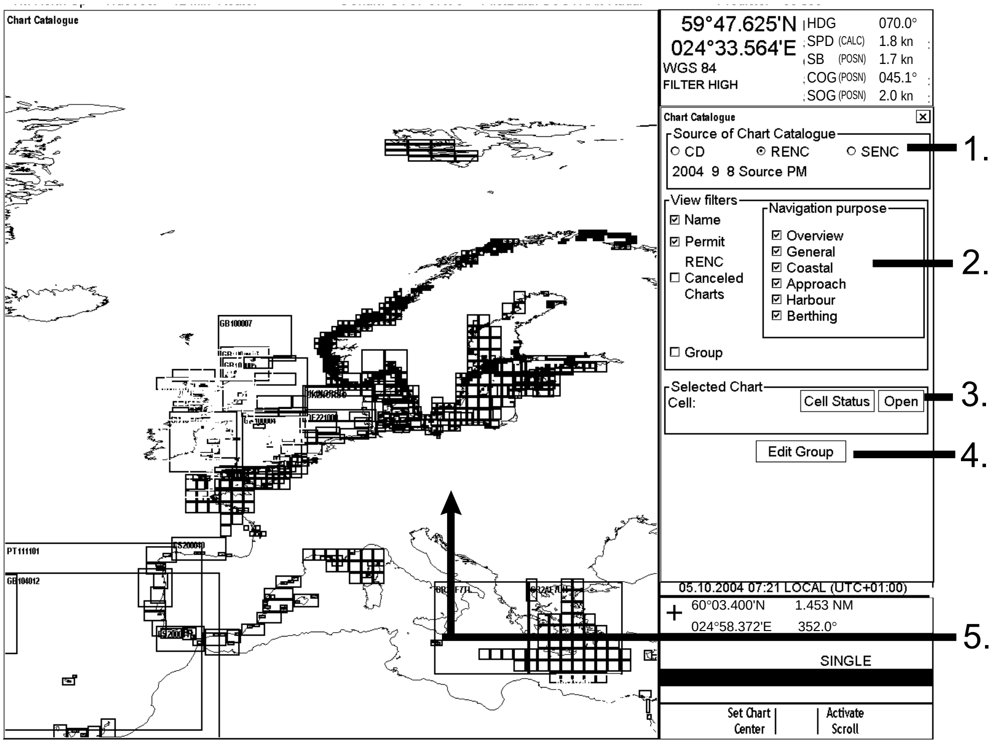

***Restart drawing process:*** This is used to restart chart drawing. Use restart drawing process, if you are not able to move chart or zoom in/out.

## 7.4.2 Catalogue of S57 cells

An S57 catalogue is used to view graphical coverage of the charts stored in your hard disk, available in a named "CD ROM" or available from an RENC. Available charts are displayed using their limits of charts. Note that sometimes the real coverage of the charts may be considerably less than the declared limits of it. You can cursor-pick any chart by going over its limit then you can view the information for it.

To display the catalogue, do the following:

1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area then push the right button.
2. Spin the scrollwheel to choose Chart Catalogue then push the scrollwheel.



**1. Source of Chart Catalogue**

- **CD ROM:** Display charts available in a named "CD ROM".
- **RENC:** Display charts available from an RENC.
- **SENC:** Display charts stored in your hard disk in SENC format.

**2. View Filters**

- **Name:** Display also cell names in graphical coverage display.
- **Permit:** Display only charts for which you have permit.
- **RENC Cancelled Charts:** Display charts that are cancelled in an RENC.
- **Group:** Display chart in selected group.
- **Navigation purpose:** Display charts for chosen navigation purpose (overview, general, coastal, approach, harbor, berthing).

**3. Selected Chart**

- **Cell:** Name of the chart
- **Cell Status:** Open Cell Status Window.
- **Open:** Open selected chart in radar.

**4. Edit Group:** For further details, see section 7.4.3 How to group S57 chart cells.

**5.** The **chart limit boxes** are color-coded as follows:

**Green** The chart is available for use in SENC format. If the source of the chart is an RENC then the chart is also up-to-date. If the source of the chart is something other than an RENC, then all loaded updates are included into the SENC.

**Orange** The chart is available for use in SENC format but the chart is either not up-to-date or has been cancelled. Either the SENC is from a former edition, the SENC is missing the latest updates or the chart has been cancelled.

**Red** If the chart is permit free, you do not have it available for use in SENC format and thus you cannot use the chart currently.
The chart requires a permit but you do not have the permit for the chart therefore you cannot use the chart currently.

**Blue** The chart is available either in ENC format, in SENC format for another software version or in SENC format for another chart radar. For example, the chart is blue during SENC conversion and when you loaded a chart into the chart radar and the system could not convert the chart into SENC format.

**Magenta** You have a permit to use the chart, but there is neither ENC nor SENC available on ECDIS, therefore you cannot use the chart currently.

### 7.4.3 How to group S57 chart cells

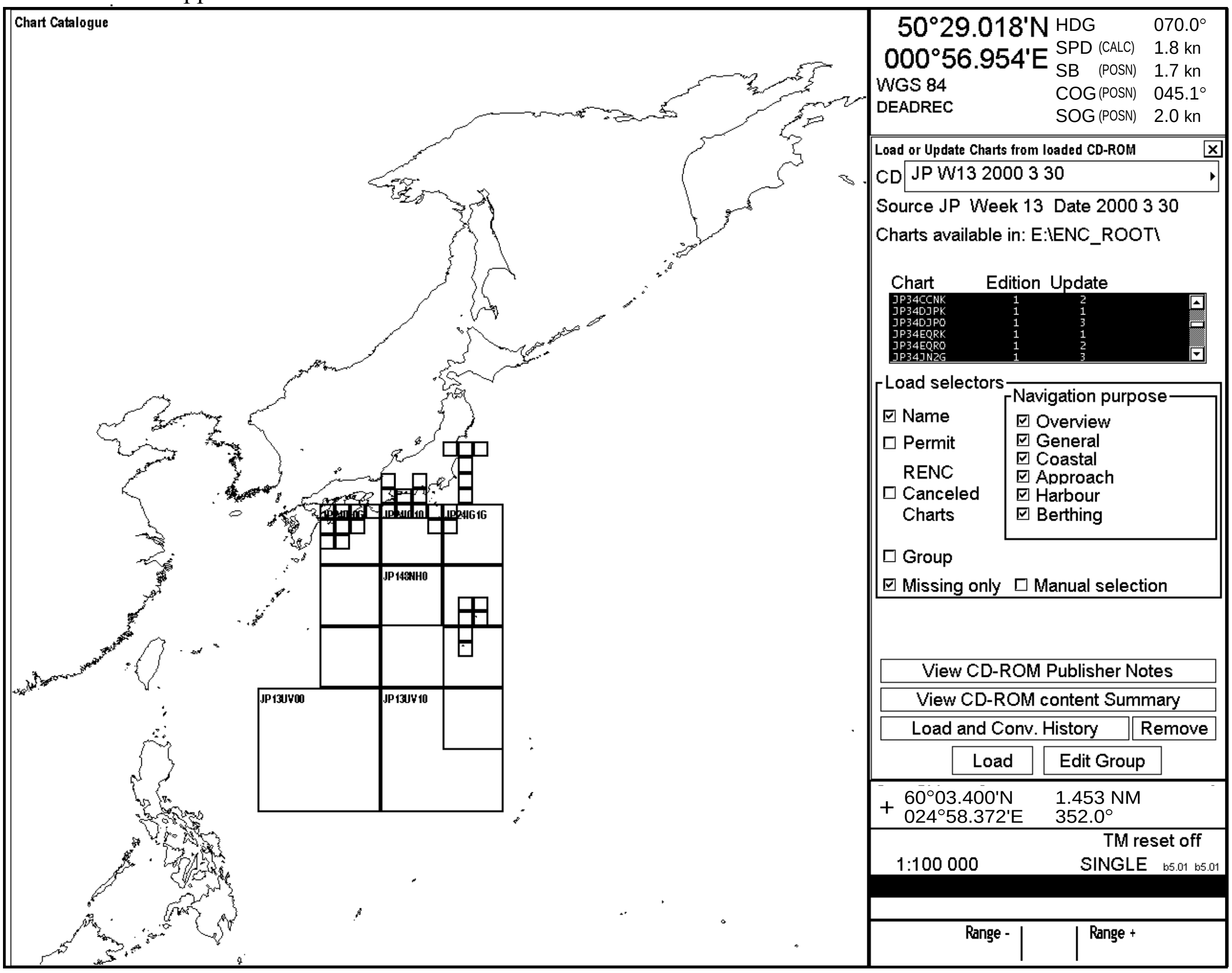
You can define groups of S57 charts. This means you can collect related charts, for example, all cells that cover a route from Liverpool to New York or all cells available from a National Hydrographic Office. This makes it easier to perform many SENC maintenance functions such as loading base cells and updates, setting Display Until and Approve Until dates, etc. Below is the procedure for how to make a group and add charts into it.

When you load or update S57 charts from CD-ROM, you are able to define a group in "Load or Update Charts from loaded CD-ROM" window. To do this, proceed as follows:

#### *How to use Load or Update Charts from loaded CD-ROM window*

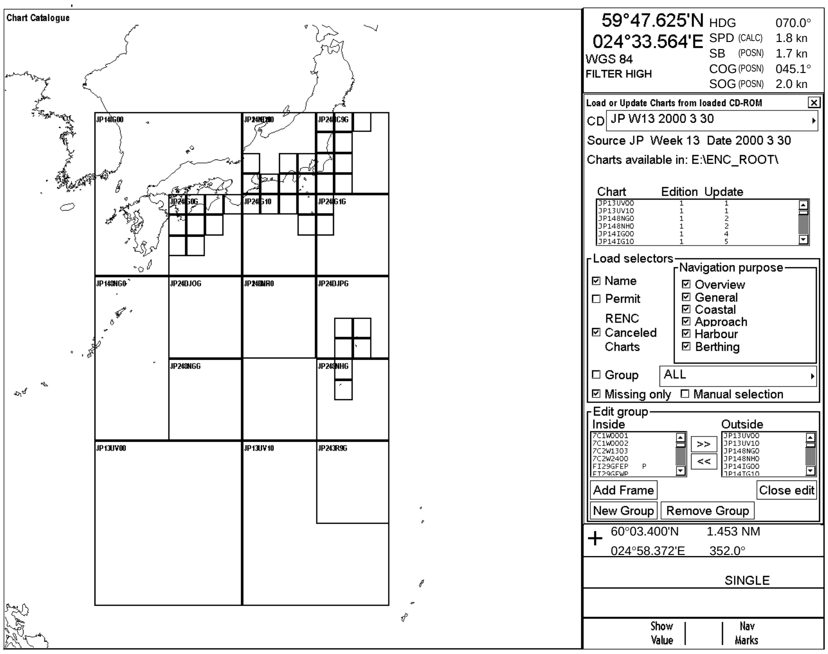
When you load or update S57 charts from CD-ROM, you are able to define a group in "Load or Update Charts from loaded CD-ROM" window. To do this, proceed as follows:

1. Select Load or Update charts>From CD-ROM in Chart menu. A "Load or Update Charts from loaded CD-ROM" window appears.

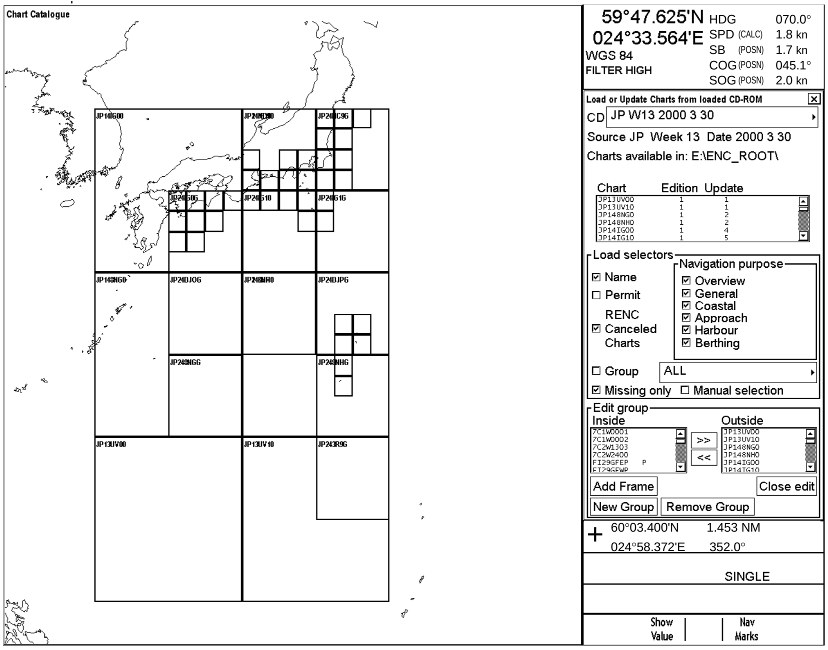



2. Click the **Edit Group** button.
3. Click the **New Group** button.
4. Enter group name and click the **OK** button

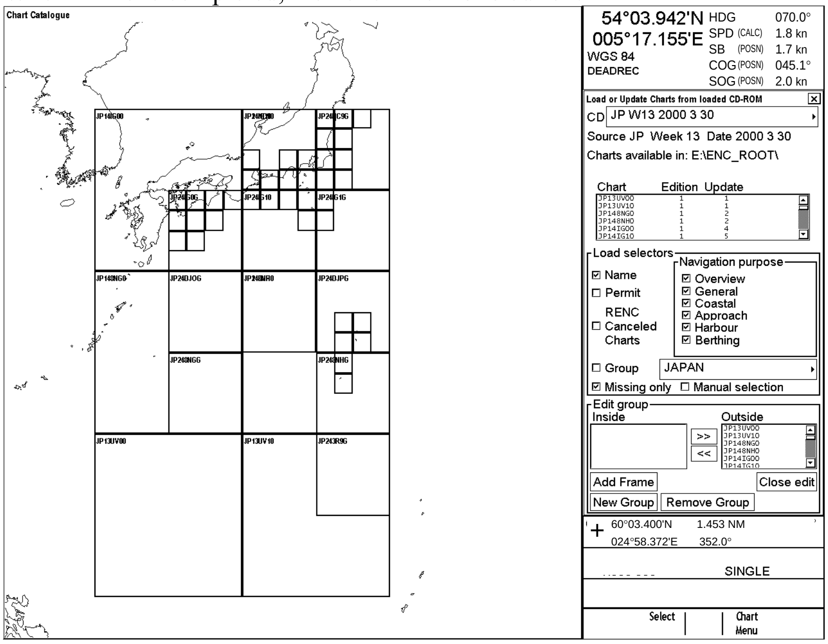
5. Click the **Add Frame** button.



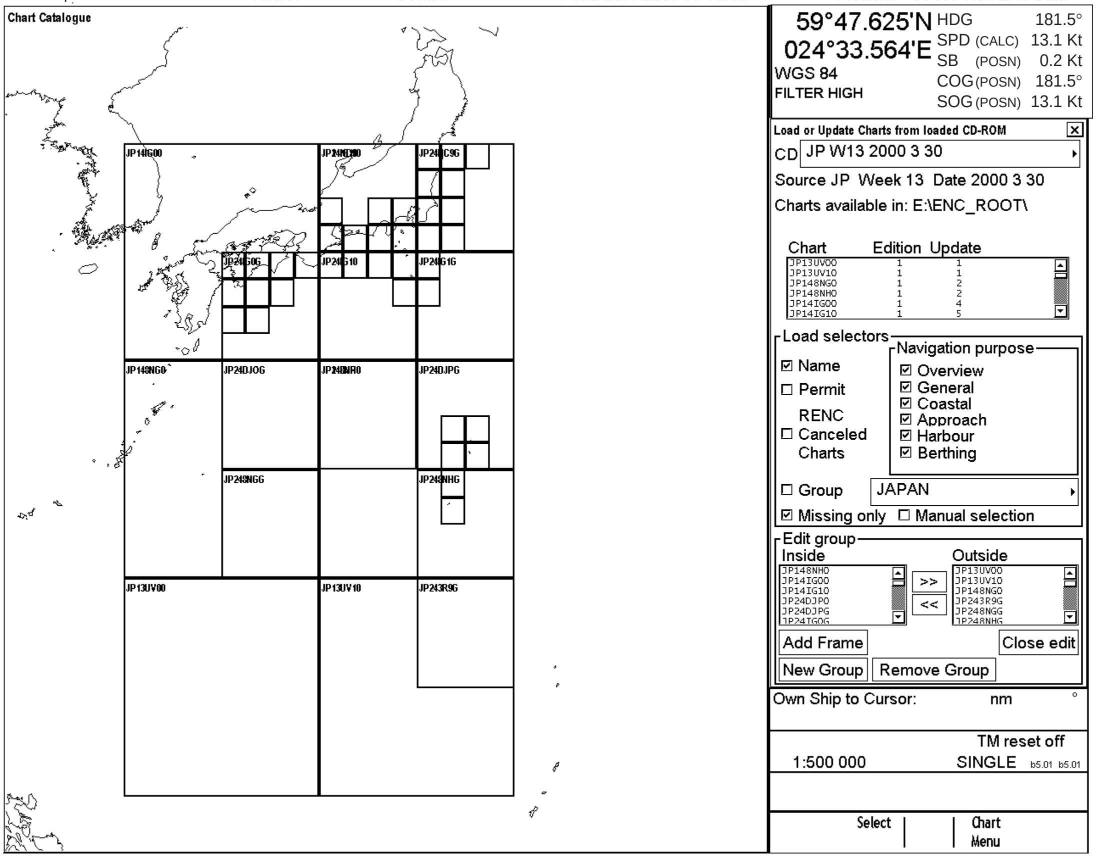

6. Use the trackball to define a frame then the push the left button.



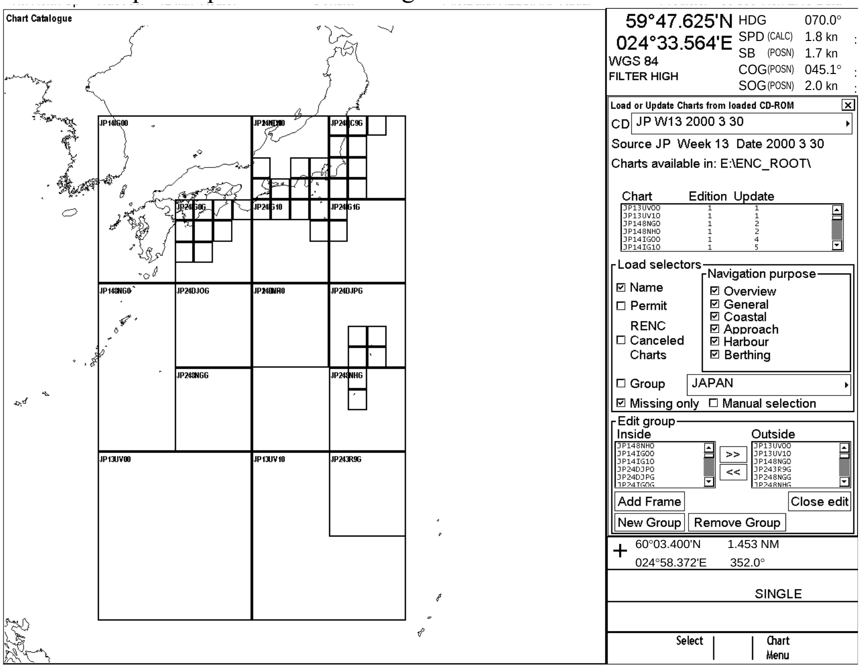
7. When frame is completed, then click the **Done** button.




8. When you have completed entering frames, click the **Close Edit** button.



9. Check Group as a qualifier for loading.

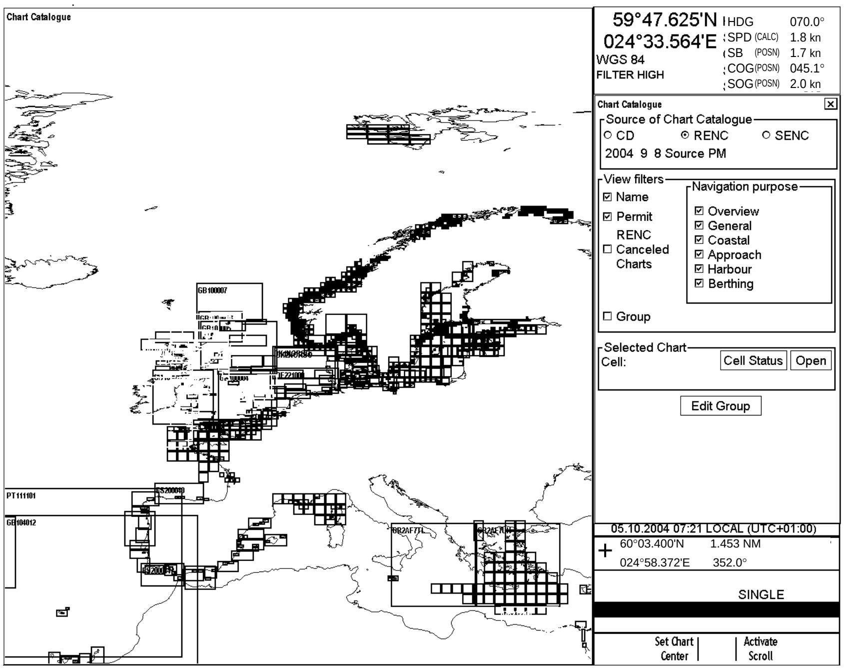



10. Click the **Load** button to load charts members of group, Japan, for example.

### *Using chart catalogue window*

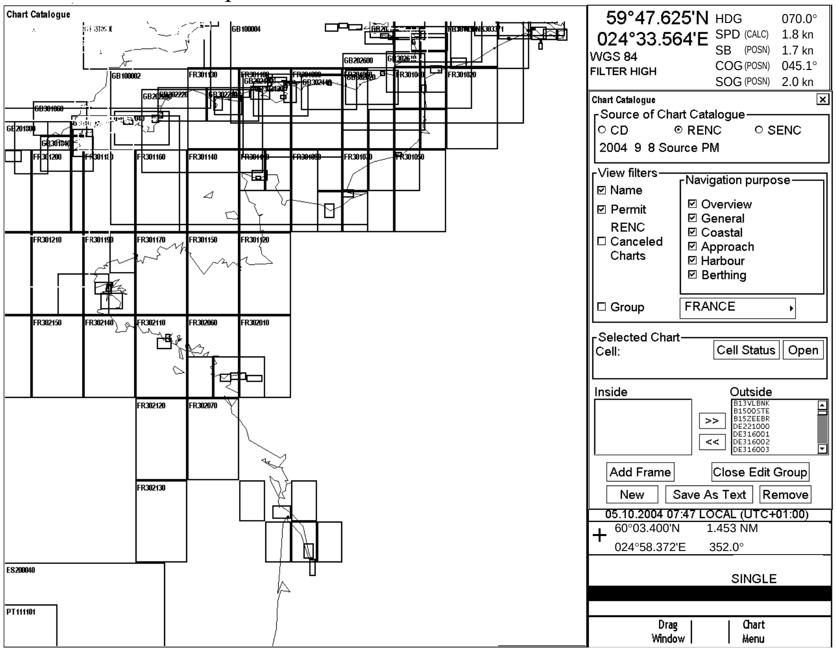
The Chart catalogue can be used to define a group as follows:

1. Select "Chart Catalogue" from the Chart menu window.



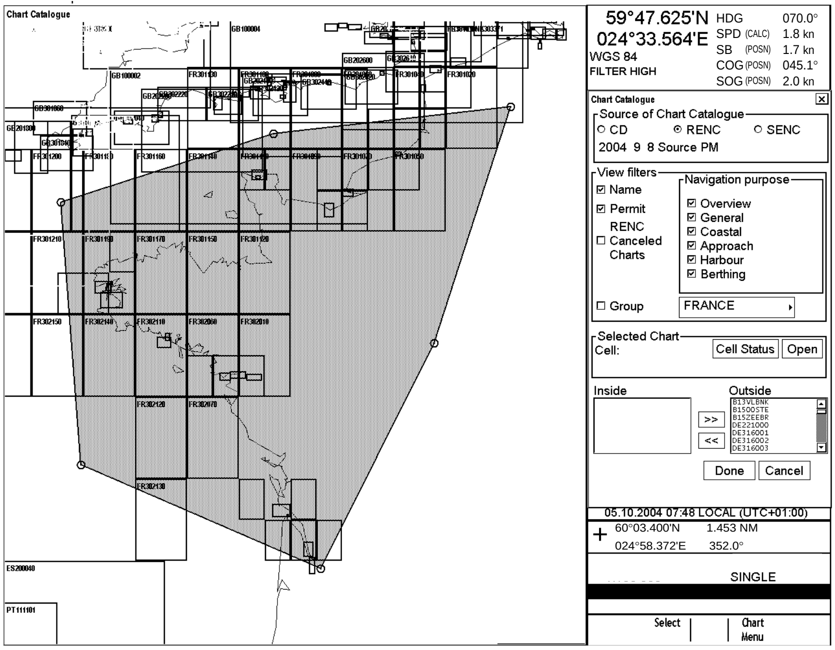

2. Click the **Edit Group** button then click the **New** button.

3. Enter name for Group and click the **OK** button.

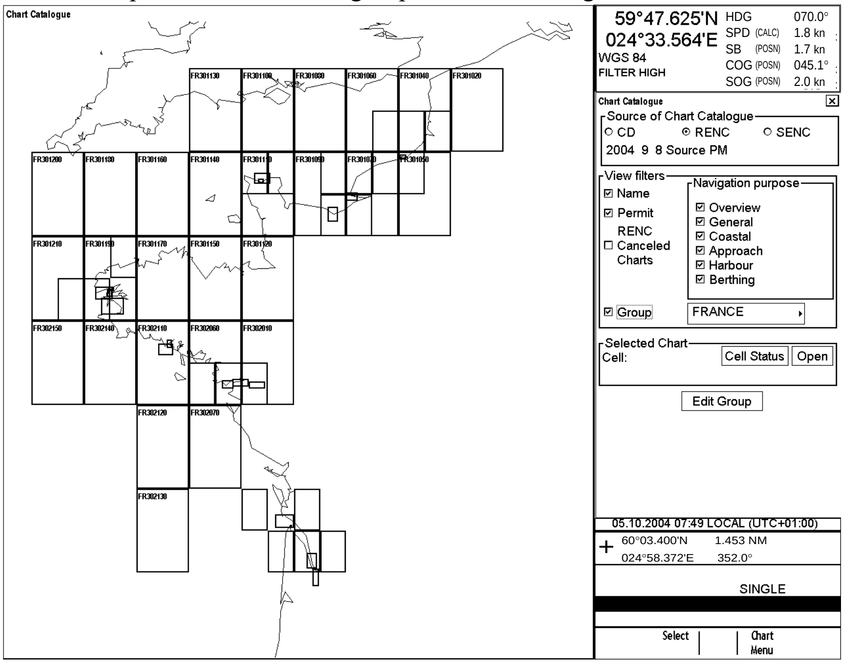



4. Click the **Add Frame** button.

5. Define frame using left mouse button and click the **Done** button.



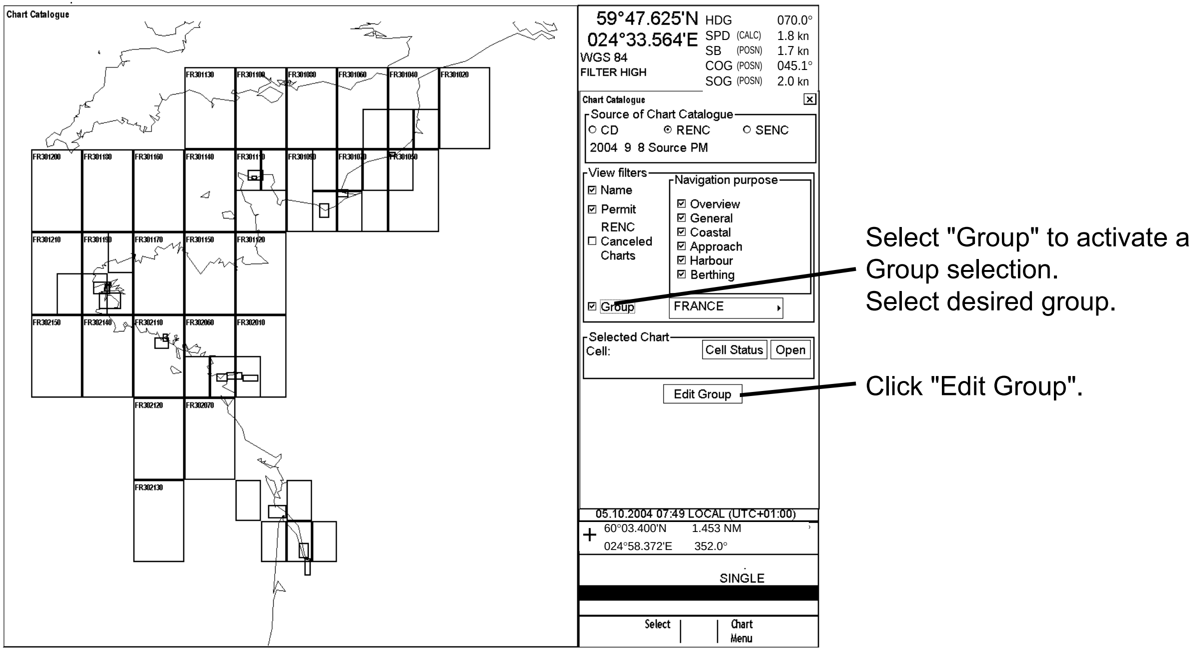
6. Select Group to view content of group in Chart Catalogue window.

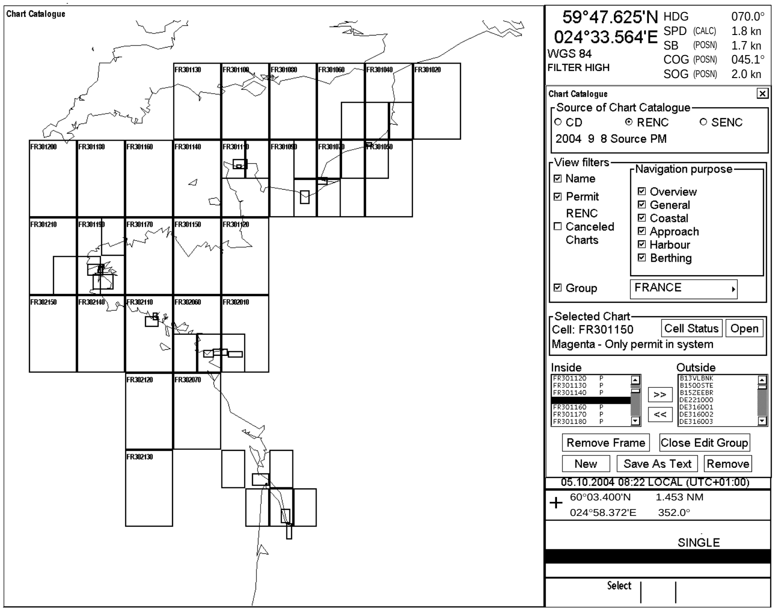



## *How to remove S57 chart cells from a group*

You can remove chart cells from a defined group as follows:

1. Select desired group.
2. Click the **Edit Group** button.
3. Use the **Remove frame** button to define area for charts or pick charts individually from the list.

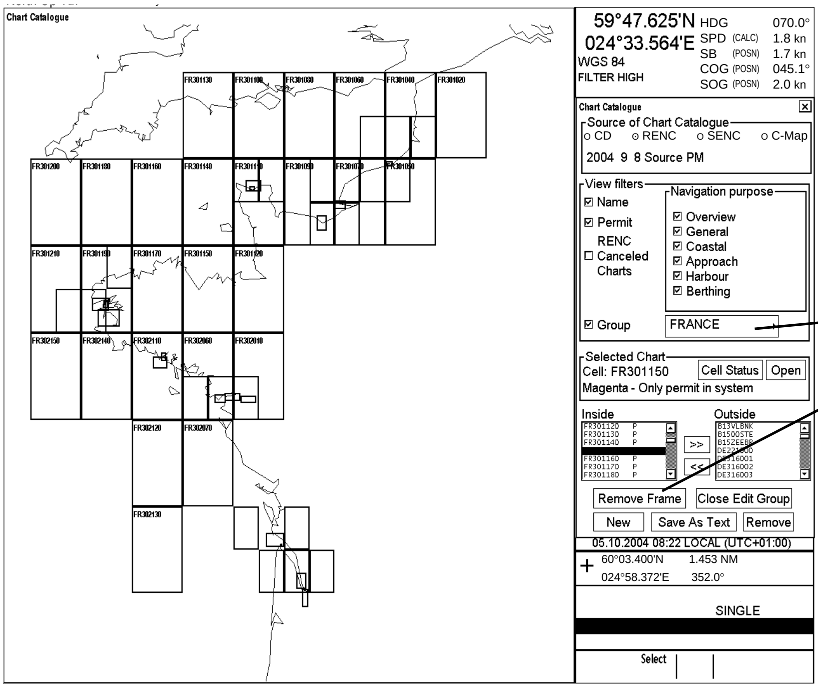





Use “Remove Frame” button, if you like to use Graphical catalog or pick individual cell using left mouse button “Select” and then click “>>“ button.

### *How to delete a group*

You can delete a defined group as follows:




1. Choose group.
2. Click Remove Frame button to delete.

### *Choosing active group for viewing with catalogue*

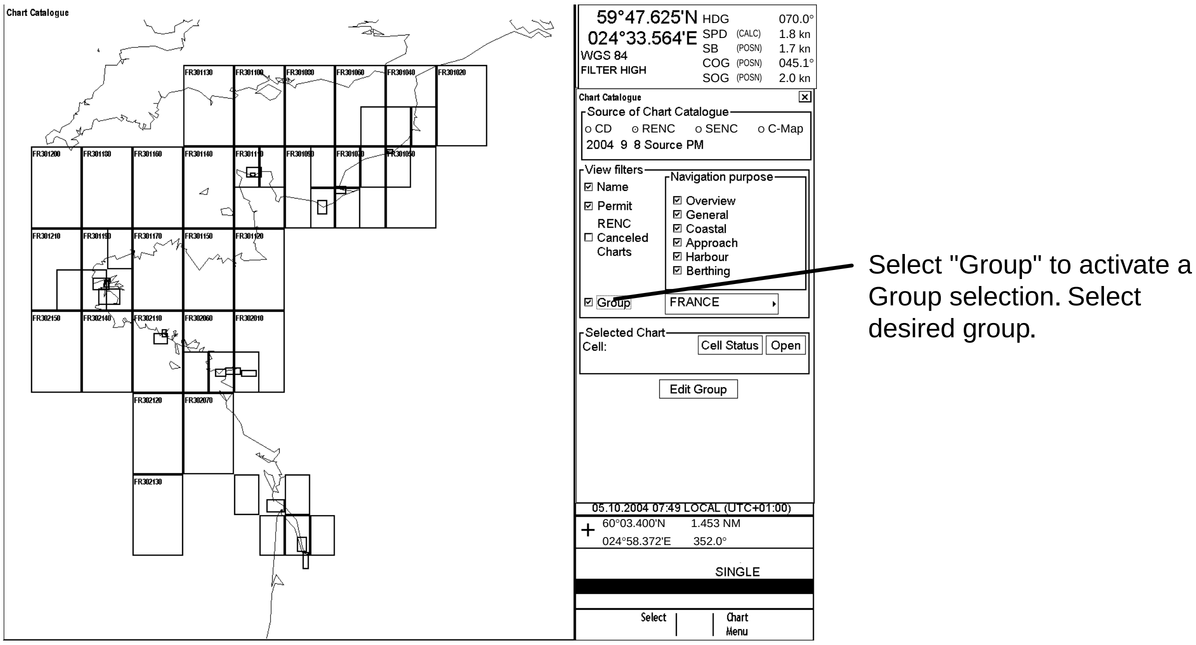
To choose active group do the following:

1. Choose Chart Catalogue from the Chart menu.
2. Check **Groups**.
3. Choose desired group from Edit Group list box.

The name of active group appears in the Active Group field.

### *How to view active group with catalogue*

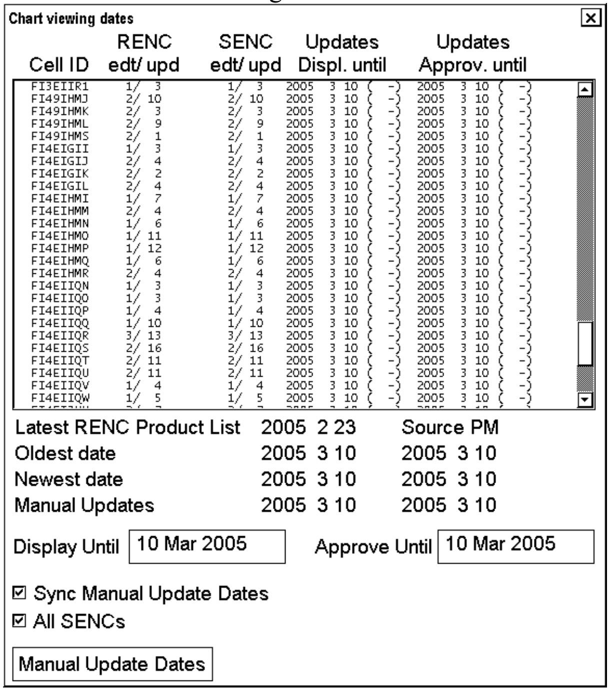
To view active group, check "Group" selection and select desired group from list box




## 7.4.4 How to view status and setting viewing dates of S57 chart cells and their updates

When you load S57 chart cell(s) and/or their updates, the system sets Display Until of S57 chart cell(s) as current date of the system. To set Approve Until as current date of the system, you must open the Set Chart viewing dates dialog box and perform Approve Until. You can view status and set viewing dates of S57 chart cells and their updates. To view status and date dependency, do the following:

Choose Set Chart viewing dates from the Chart menu. The Chart Viewing date dialog box appears.




Recommended settings in Chart viewing date are:

- Sync Manual Update Dates: ON position
- All SENCs: ON position

**RENC edt / upd:** The column "RENC" contains edition/update status from Product List.

**SENC edt / upd:** The column "SENC" contain edition/update status from "SENC", i.e., loaded and converted in the chart radar.

**Updates displ. until:** "date until updates" is displayed. You can enter desired date by using the Display Until field. The number after the date shows the number of updates for the displayed cell (number of displayed updates / number of updates in SENC format).

**Updates approv. until:** View the Date Until updates is approved. You can enter desired date by using the Approve Until field (number of approved updates / number of updates in SENC format).

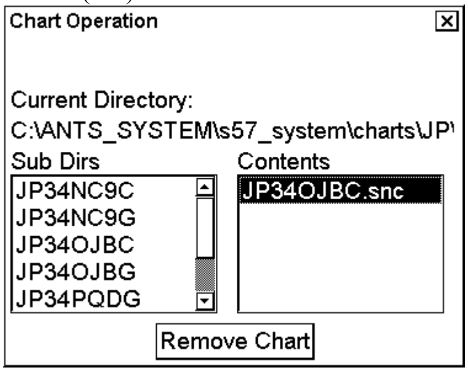
The issue date of the Product List used is displayed as "Latest RENC Product List". An RENC Product List contains information about the charts stored in RENC and the date when the Product List was issued. If the chart radar does not contain any Product List, then the date of the Product List is displayed as "—NVLD—".

The ">>>" mark is used to indicate that a chart is not up-to-date. The "<<<" mark is used to indicate that SENC contains newer information than the information in an RENC Product List. (You can need to load newer RENC Product List.) Cancelled charts are indicated as "cancelled" instead of "edtn/updn". If an SENC contains a cancelled chart, then the indication ">>>" is replaced with "XXX".

## 7.4.5 How to remove an S57 chart cell from the system

To remove an S57 format vector chart cell from the system, do the following:

1. Choose Remove Charts from the Chart menu.
2. Choose chart cells to remove from the system. You can remove base cell (000), updates (001…) and SENC format (snc).




3. Click the **Remove Chart** button

4. Click the **OK** button to remove the chart chosen.

The system will remove file(s) from the hard disk.

# 7.5 S57 Chart Service from an RENC

## 7.5.1 Introduction

Before you can use an RENC service, you have to be authorized as a customer of an RENC. To be authorized you have to contact an official distributor (chart agent) of RENC. Then, the following services are available:

## 7.5.2 Permits

Permits are used to control the permission to use a chart. A permit in RENC security is connected to an edition.

Permits are issued as two different types:

- **Subscription permit.** These include updates for subsequent 12 months. It is assumed that a typical user is a SOLAS class ship, which is required to use up-to-date charts.
- **One-Off permit.** These include only updates up to the issue date of the permit. It is assumed that a typical user is a non-SOLAS class ship, which is not required to use up-to-date charts.

Each permit also includes the expiry date. The expiry date of a permit controls the ENC to SENC conversion. If the issue date of a chart or update is older or equal to the permit expiry date, then the system can convert an ENC into the SENC. There are no viewing time limits as used in some other security systems. The user has a right to view a chart forever and moreover he has a right to convert a chart from its ENC format into the SENC forever.

An RENC can issue permits in two formats:

- **"*.pmt" format.** This format does not include the applicable chart edition nor does it include applicable permit type.
- **PERMIT.TXT format.** This format includes the applicable chart edition as well as applicable permit type.

Both permit formats are fully operational, but the older "*.pmt" format creates confusion because it cannot support the user when chart edition changes.

The system display warnings associated with expiry date. Examples are "will expire" warning 30 days before the expiry date and "have expired" after the expiry date. These warnings are relevant only for Subscription permits. Only the new PERMIT.TXT format supports the system to suppress irrelevant warnings associated with expiry date.

## 7.5.3 Product list

A Product List is maintained by an RENC. You can retrieve the Product List from an RENC via telecommunications or you can load it from the CD ROM of an RENC. This list contains an up-to-date list of available charts and their edition/update status in an RENC. When you load a CD ROM or use telecommunications to receive a Product List from an RENC, the chart radar checks the issue date of the Product List. If the issue date indicates a newer Product List, then it is copied into the chart radar. If the issue date indicates an older Product List, then chart radar shows a notice to the user that newer Product List is already loaded.

## 7.5.4 Authentication

Normally the authentication process is invisible to the user. Only if the authentication fails, then the user gets an appropriate notice. From a user point of view, the authentication is similar to the CRC checksum test. If the CRC checksum test or authentication fails, then the chart is unusable.

Authentication uses a private key and a public key. A digital signature associated with each chart contains a private key. A public key is stored in the chart radar and it is truly public. RENC may publish a new public key. This public key will be available as text by fax, by post, by front page of a newspaper, etc. and as a text file, for example, PRIMAR.PUB.

### 7.5.5 Available service types

#### *CD ROM service*

If you are using a CD ROM service, you receive the following from an RENC:

- Base CD ROM contains all base cells that are available in an RENC CD ROM database when the CD ROM was released.
- Update CD ROM contains all updates to the Base CD ROM, but it will also contain any new base cells and new edition and re-issues received from the contributing Hydrographic Offices. Update CD ROM will be issued once a week.

If you want to enlarge your chart coverage, you have to contact your distributor to order more permits for new charts.

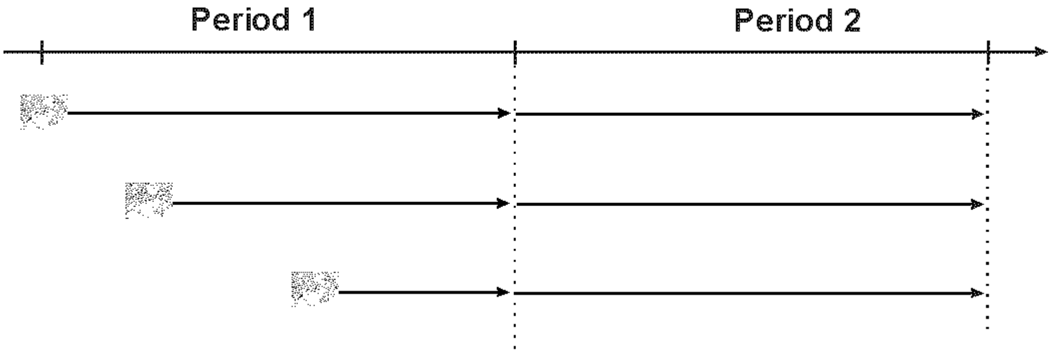
#### *Subscription types*

Charts and their updates stored in RENC are decrypted and you have to get a key (permit) to load charts into the chart radar. There are two different kinds of permits: subscription and one-off.

#### Subscription

Subscription period is 12 months and it starts when you order first permit(s) from an RENC.

- User subscribes to an updating service
- Updating service has a renewable expiration date
- ENC is still available after expiration, but cannot apply any new information
- User will receive the following during the service period:
    - All updates issued to the ENC
    - Any re-issues for the ENC
    - Any new edition of the ENC




If you enlarge your chart coverage during your subscription period as shown above, the date of subscription expiration for all charts will be the same date.

#### *One-Off*

In the one-off permit, you order permit for chart and updates that are valid until date you order permit (i.e., chart is up-to-date when you ordered it). No more information can be retrieved for this chart, which is published after order date.

**One-Off Current Edition:** Permit for a chart that is based on data on the hard disk of the chart radar.

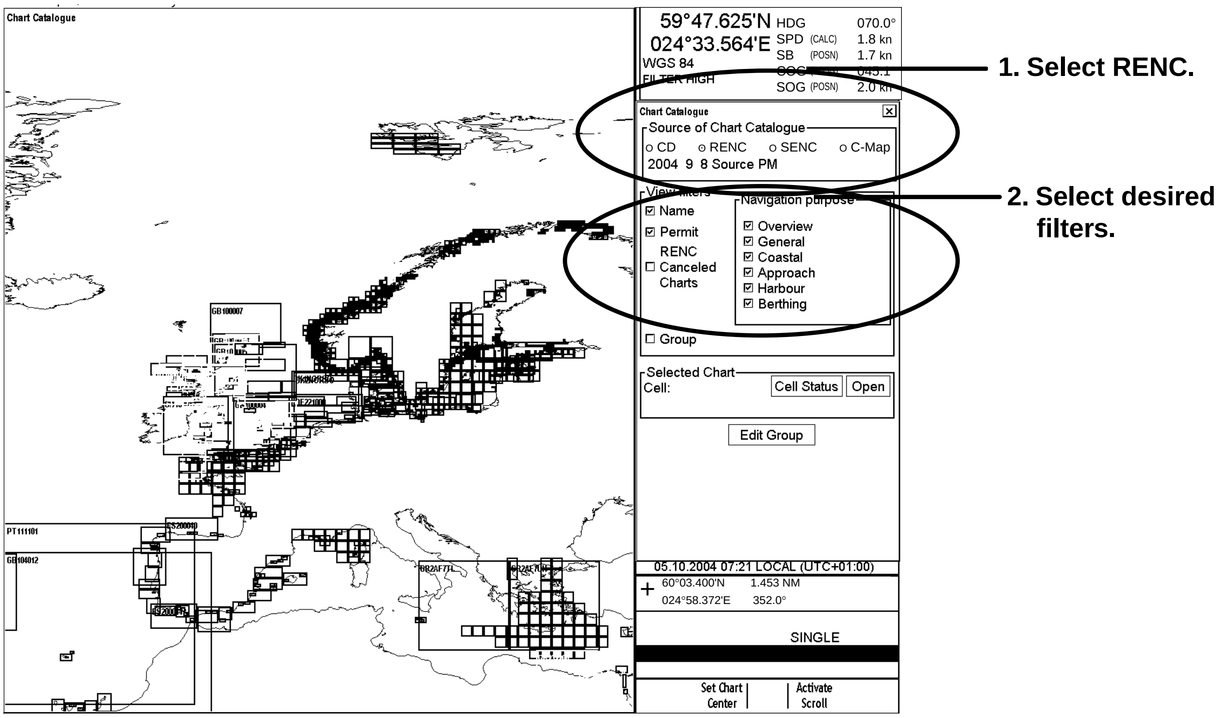
**One-Off Latest Edition:** Permit for a chart that is the latest available based on the Product List of an RENC.

# 7.6 Services Provided by an RENC

## 7.6.1 How to view the coverage of an RENC service

To view the Product List in graphical presentation, use the catalogue, which you can display by opening the Chart menu and choosing Chart Catalogue. The catalogue of S57 charts shows the situation when you last ordered the Product List from an RENC or loaded the latest Base or Update CD ROM into the chart radar.

**Note:** The chart radar automatically keeps the latest available Product List. Thus the chart radar does not load the Product List if it is older than the one already loaded into the chart radar.




The chart limit boxes are color-coded as follows:

**Green** The chart is available for use in SENC format. If the source of the chart is an RENC, then the chart is also up-to-date. If the source of the chart is something other than an RENC then all loaded updates are included into the SENC.

**Orange** The chart is available for use in SENC format but the chart is either not up-to-date or has been cancelled. Either the SENC is from a previous edition, the latest SENC update was missed or the chart has been cancelled.

**Red** If the chart is permit free, you do not have it available for use in SENC format and thus you cannot use the chart currently.
If the chart requires a permit and you do not have the permit for the chart, you cannot use the chart currently.

**Blue** The chart is available either in ENC format, in SENC format for another software version or in SENC format for another chart radar. For example the chart is blue during SENC conversion and if you loaded a chart into the chart radar and the system could not convert the chart into SENC format.

**Magenta** You have a permit to use the chart, but the chart is not available in SENC format and thus you cannot use the chart currently.

## 7.6.2 How to find up-to-date status of a chart from an RENC

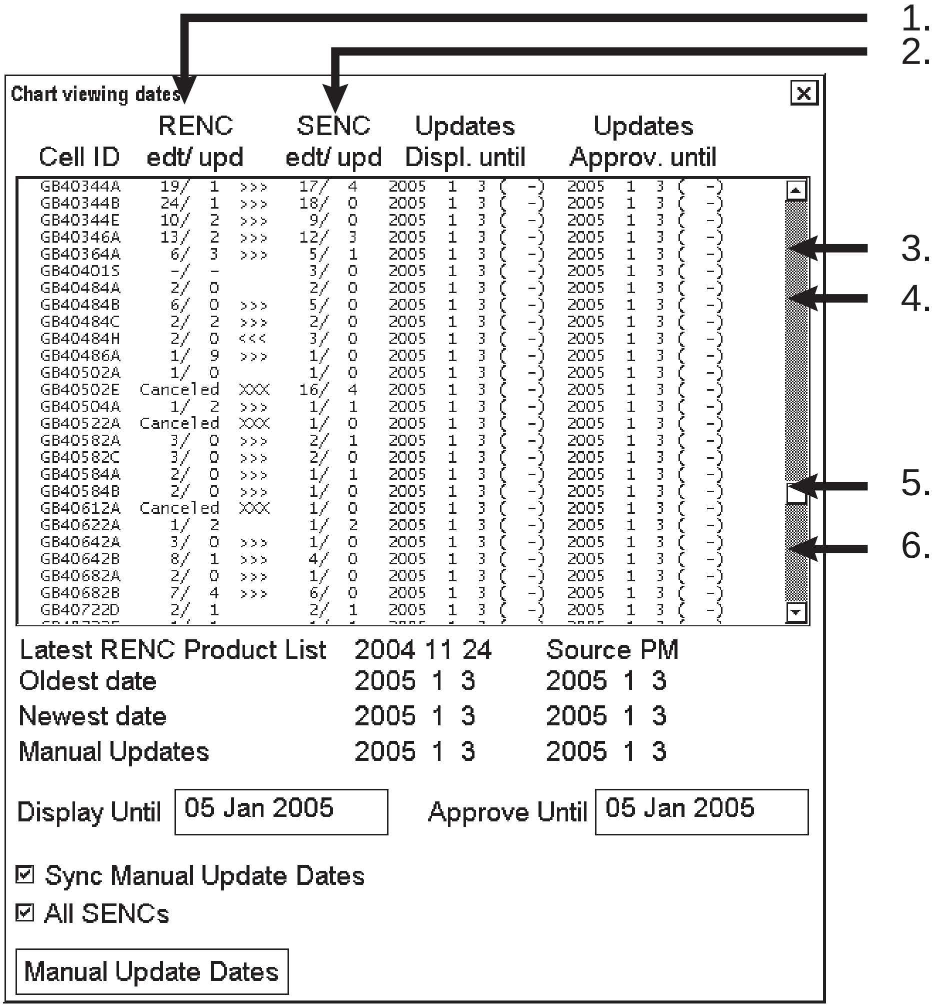
To keep charts up-to-date, you should check for updates with an RENC weekly. The chart radar compares charts used to Product List of an RENC. If a Permanent message appears on the chart display of chart radar (at the upper left corner), this means that the charts used were checked against the Product List and at least one of the charts used is not up-to-date. See the Permanent message below.

> **Permanent message**
>
> At least one of used charts is not up-to-date. Get or load latest updates from your RENC service. Use Chart Menu - Set Chart viewing dates to check charts.

The information of available charts and their up-to-date status is available both in the catalogue and in the Chart viewing dates window.

**The easiest method to check if charts are up-to-date is to view the catalogue and check that the names of all required charts appear in green. The names of charts that are not up-to-date appear in orange. For further details see section 7.6.1 How to view the coverage of an** RENC service**.**

You can also use the Chart viewing dates window in the Chart menu when you have doubt that some charts are not up-to-date or the Permanent message shown above is displayed.

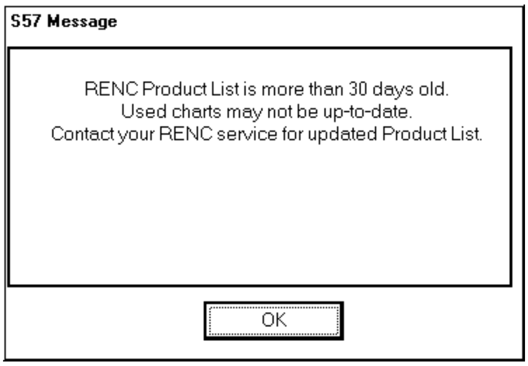


***How to interpret the chart viewing date window***

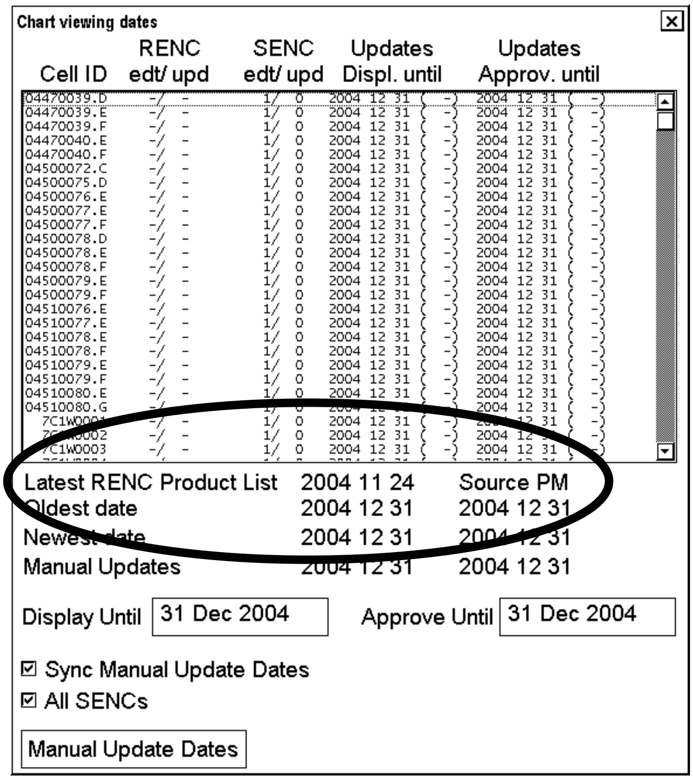
- RENC edt / upd: The chart's edition and its update in an RENC appear here. The information is based on the last-ordered Product List.
- SENC edt / upd: The chart's edition and its update in the chart radar appear here.
- If a chart is not available in an RENC but it is in the chart radar the RENC edt/upd shows " -/ -".
- If a chart in the chart radar is newer than the associated chart in an RENC, for example, the Chart viewing date window the RENC edt/upd field shows "2/ 8" and the SENC edt/ upd field shows "2/ 9".
- Chart Displayed and Approved Until are set based on Updates number (Updates Displayed and Approved until as NVLD (Not Valid) indication).
- If a chart in the chart radar is older than the associated chart in RENC, for example, the RENC edt/upd field shows "1/ 21" and the SENC edt/ upd field shows "1/ 0".

## 7.6.3 How to find up-to-date status of an RENC product list

The chart radar periodically checks for the last time you ordered the Product List from an RENC. If the Product List is more than 30 days old, the chart radar displays the S57 Message shown below:




To check the date when you last ordered the Product List of an RENC CD ROM, choose Set Chart viewing dates from the Chart menu. The date the Product List was last ordered is shown at the lower left corner of the Chart viewing dates window.

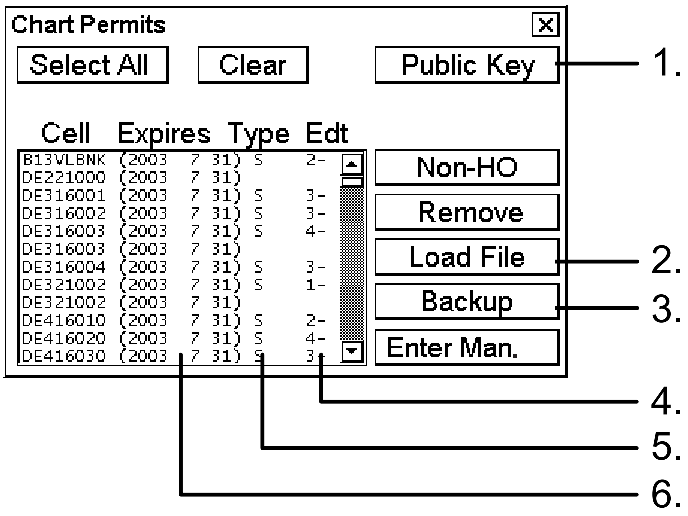


### 7.6.4 How to manage permits from an RENC

Permits are used to control the right to use a chart in the chart radar. A permit in an RENC ENC service is connected to an edition of a chart. Permits are issued in different types:

- **Subscription permit:** This type of permit includes updates for subsequent 12 months.
- **One-Off permit:** This type of permit includes only updates up to the issue date of the permit.

The expiry date of a permit controls the loading of base charts and their updates to the chart radar. The chart radar will warn you when you are loading charts or updates that are issued less than 30 days before the expiration date of a permit. If a permit has expired, it is impossible to load a chart or its update that was issued after the expiration date of the permit. The user has a right to view a chart forever, but it will not complete the requirements for having up-to-date charts. To view the Chart Permits window, open the Chart menu and choose Chart Permits.



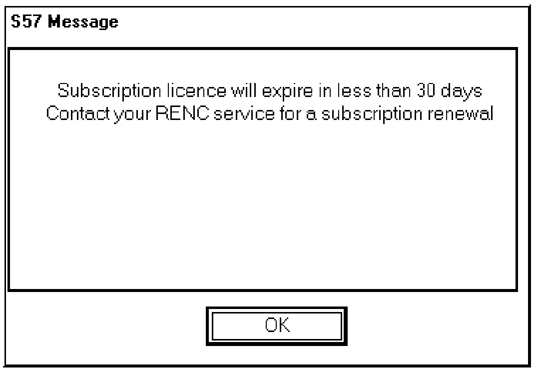

#### *Description of the chart permits window*

1. **Public Key** lets you view a public key or load a new one.
2. **Load File** enables downloading from an RENC when you receive permits from that RENC.
3. **Backup** makes a back-up copy of permits.
4. The **Edt (Edition)** field displays edition number of a chart to which the permit is valid. Note that when a new edition of a chart is issued a new permit is required. It is possible to have permits for different editions of the same chart.
5. The **Type** field shows type of permit held for a chart: S, Subscription or O, One-off.
6. The **Expires** field shows the expiration date of permits. All subscription-type permits will expire on the same date.

### *Subscription warnings*

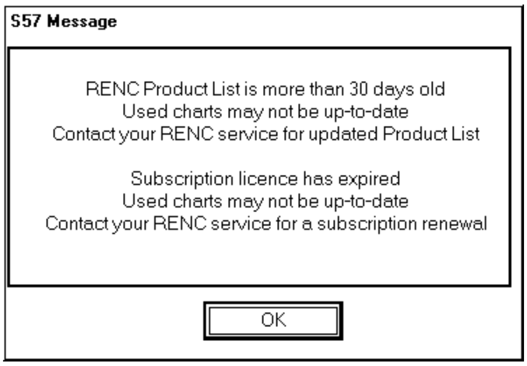
If you have at least one subscription-type permit, the system will automatically warn you about the expiration date of your subscription license.

Warning about soon-to-be-expired subscription is activated every 12 hours when it is less than 30 days from the expiration date.



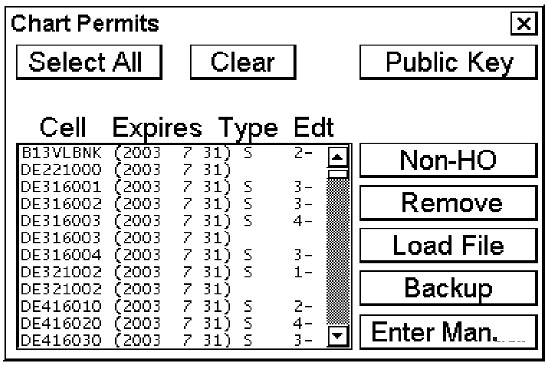

Warning about expired subscription is activated every 12 hours after the subscription has expired.

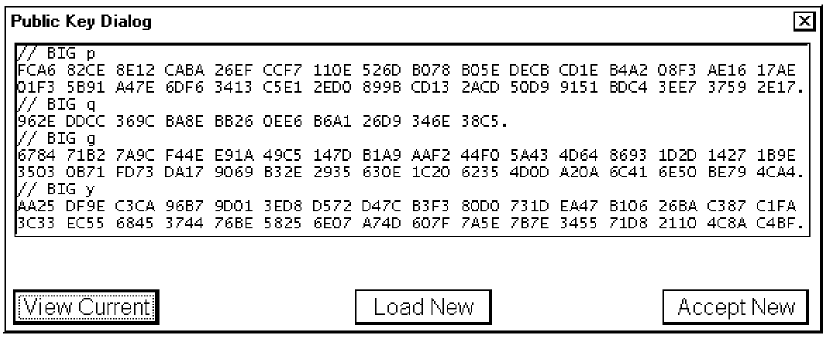
**Note:** The top half of this message display provides a warning that the Product List is not up-to-date.



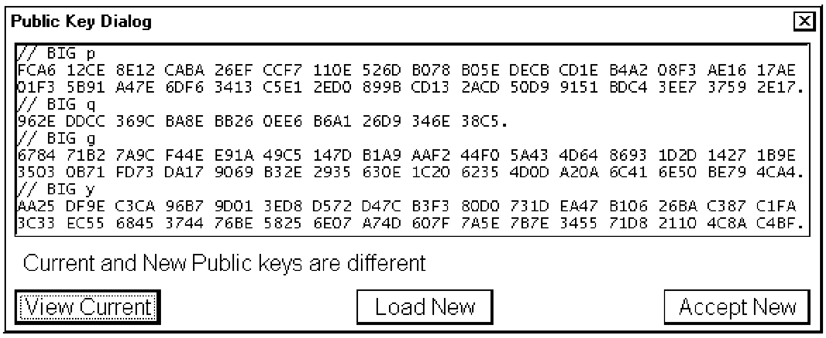

## 7.6.5 How to manage public key from an RENC

To view a public key or to load a public key into the chart radar, choose Chart Permits from the Chart menu then click the **Public Key** button.



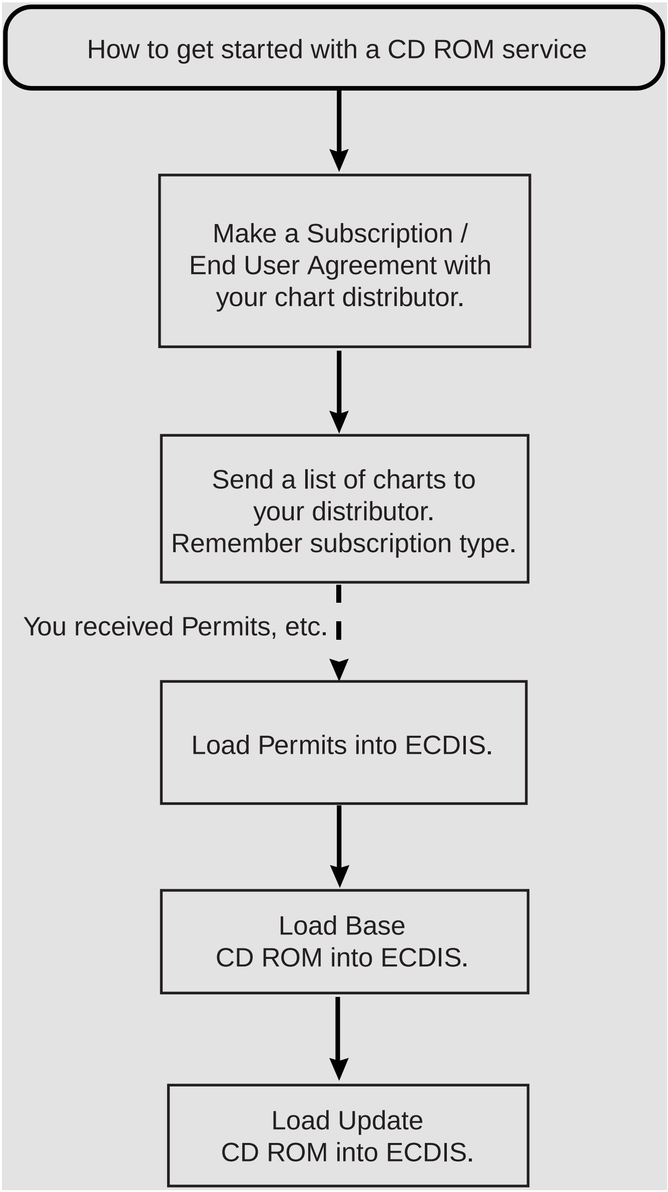

The **View Current** button displays current public key. The **Load New** button loads a new public key from *.PUB file (for example, PRIMAR.PUB) and displays that file's contents.



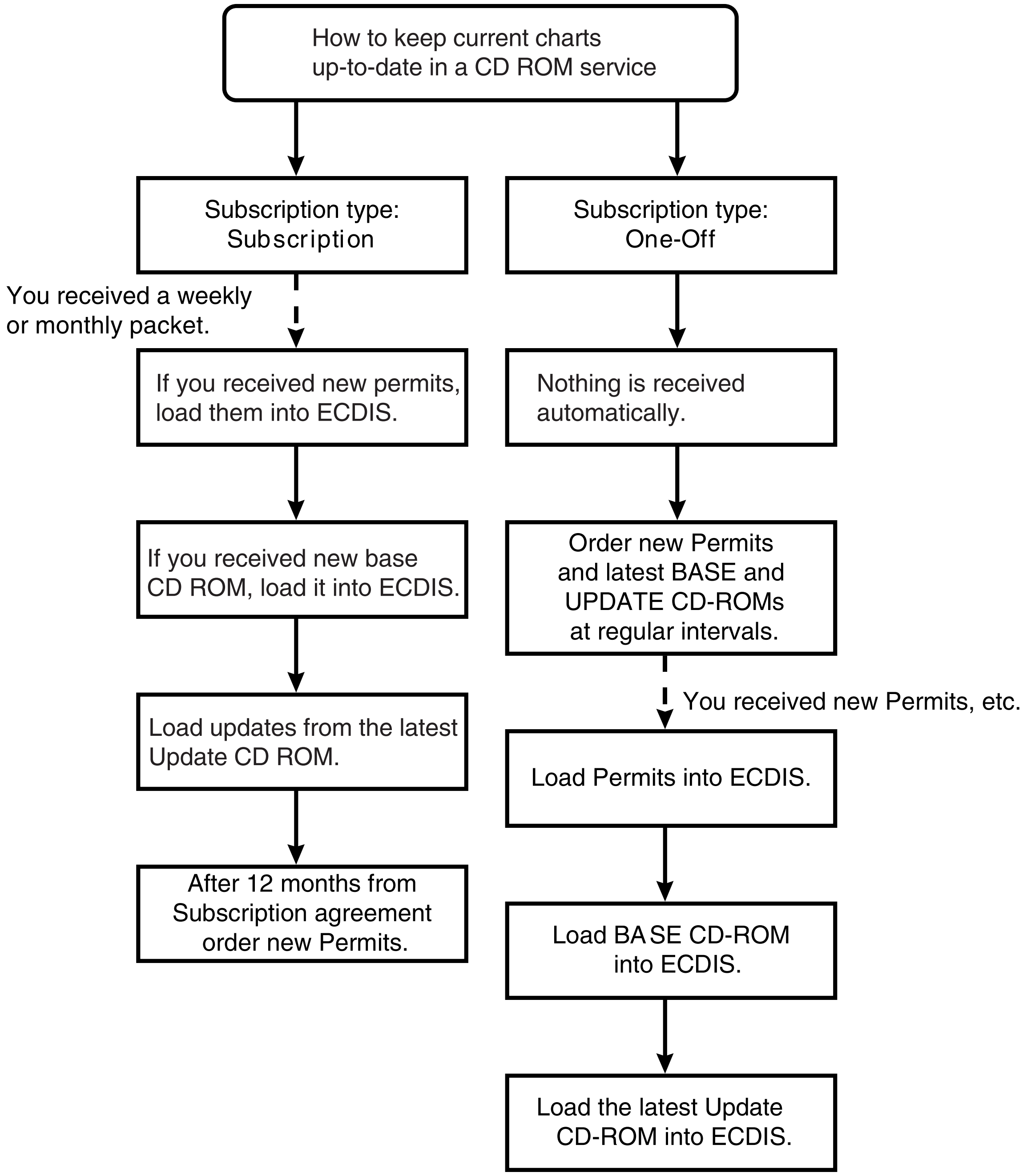

Compare the content of the newly loaded public key with the known content of the public key of an RENC you use. If the contents are the same, you can accept the newly loaded public key by clicking the **Accept New** button.

# 7.7 CD ROM Service From an RENC

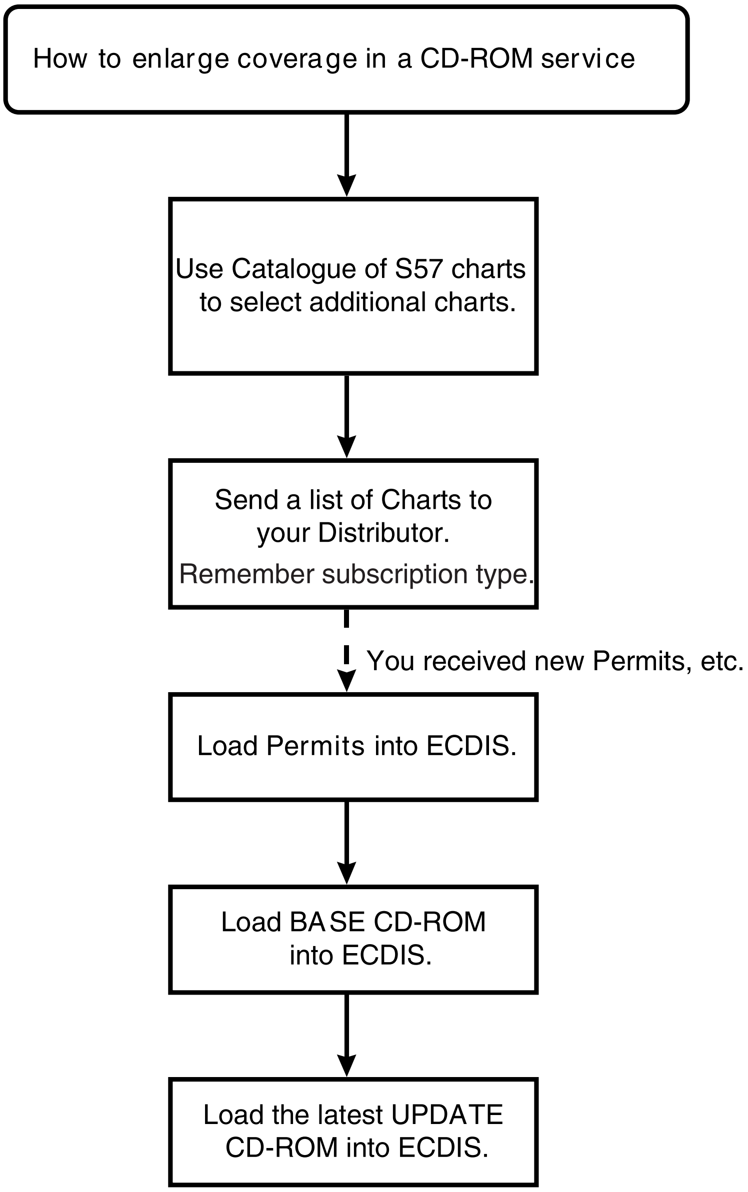
## 7.7.1 How to get started with S57 charts using an RENC



### 7.7.2 How to keep S57 charts up to date using an RENC



### 7.7.3 How to expand chart coverage using an RENC



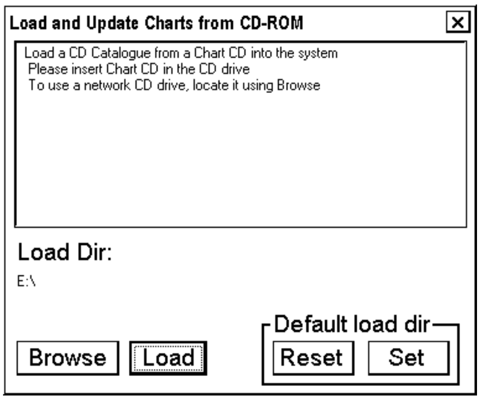

### 7.7.4 Base CD ROM from an RENC

A Base CD ROM from an RENC contains all the charts stored in an RENC when the CD ROM was issued. When you load charts (using the CD ROM catalogue) the following information is also loaded into the chart radar's hard disk:

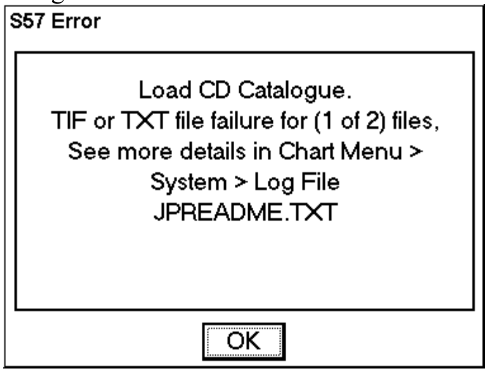
- The Content Summary of the Base CD ROM
- Publisher Notes
- Product List

When you receive a new Base CD ROM from an RENC, load charts into the chart radar as follows. Note that it is very typical that the Product List of a base CD ROM is older than the Product List in use.

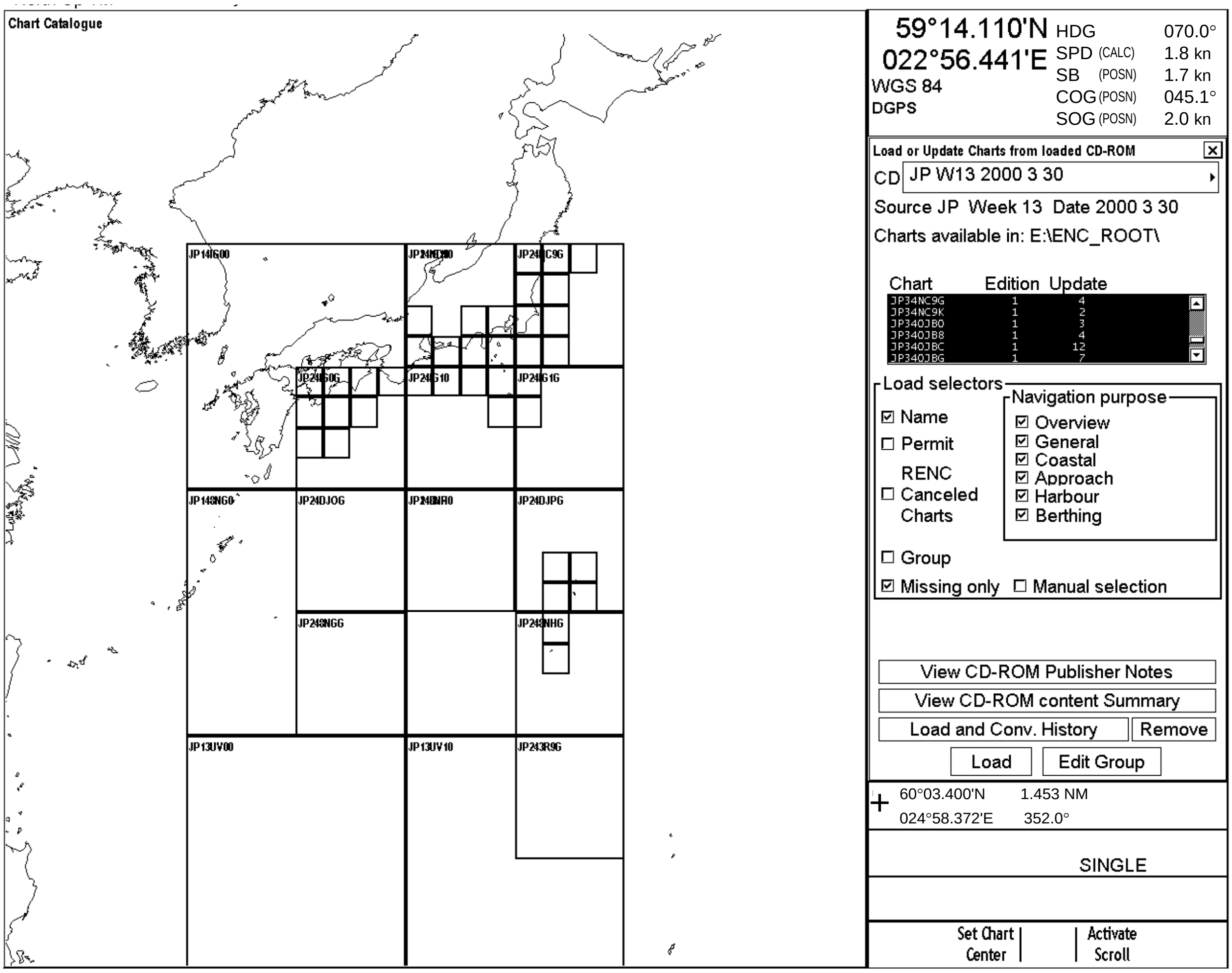
1. Check that you have already loaded correct Public key. This is very important if you receive CD ROMs for multiple RENC. For details, see section 7.6.5 How to manage public key from an RENC.
2. Input CD ROM to drive.
3. Choose Load and Update Charts from the Chart menu and "from CD ROM" from the sub menu. If the following window appears, you have to define location of CD ROM then click the **Load** button. If you want to load from another chart radar via LAN, you have to change Load Dir. Click the **Browse** button to select a new Load Dir.



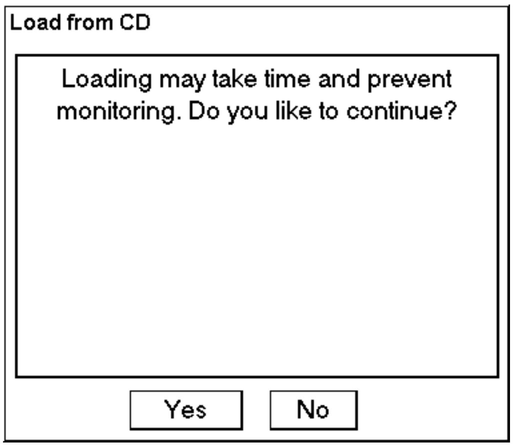

4. When you click the **Load** button, the chart radar loads Content Summary, Publisher Notes and Product List from the CD ROM and opens the Load and Update Charts from CD ROM dialog box.
5. The system automatically copies all text and pictures files associated with charts on the CD ROM catalogue, keeping only the latest version of these. If your system is already using the latest text and picture files you will get the notice below.



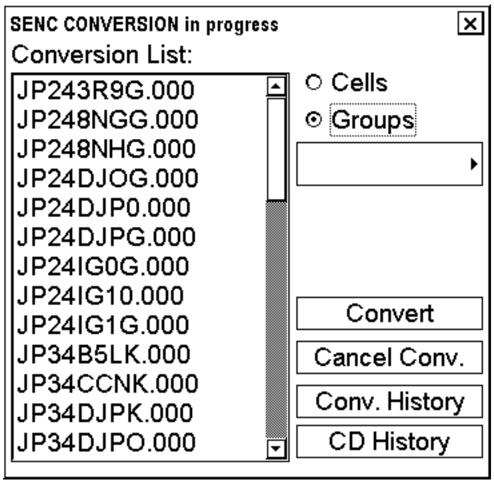
6. In the Load or Update Charts from CD ROM dialog box, choose the charts to load into chart radar then click the **Load** button to load.



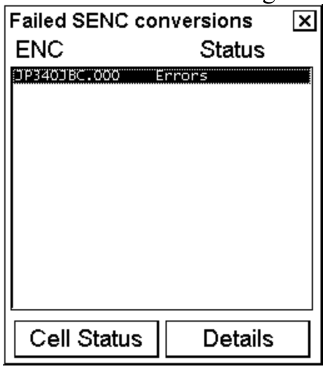

7. Before loading begins (then automatically converts them into SENC format) you are asked confirmation for this operation.



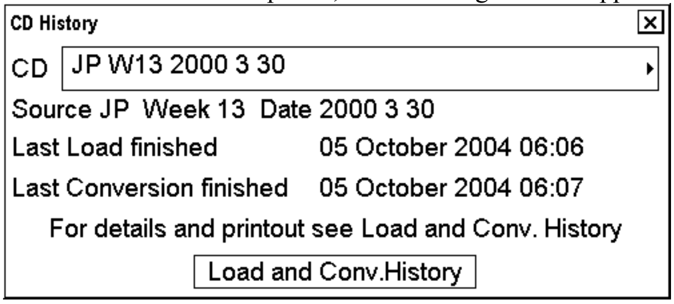

8. The SENC conversion window appears.




9. If error is detected during conversion from ENC to SENC, the following window appears.

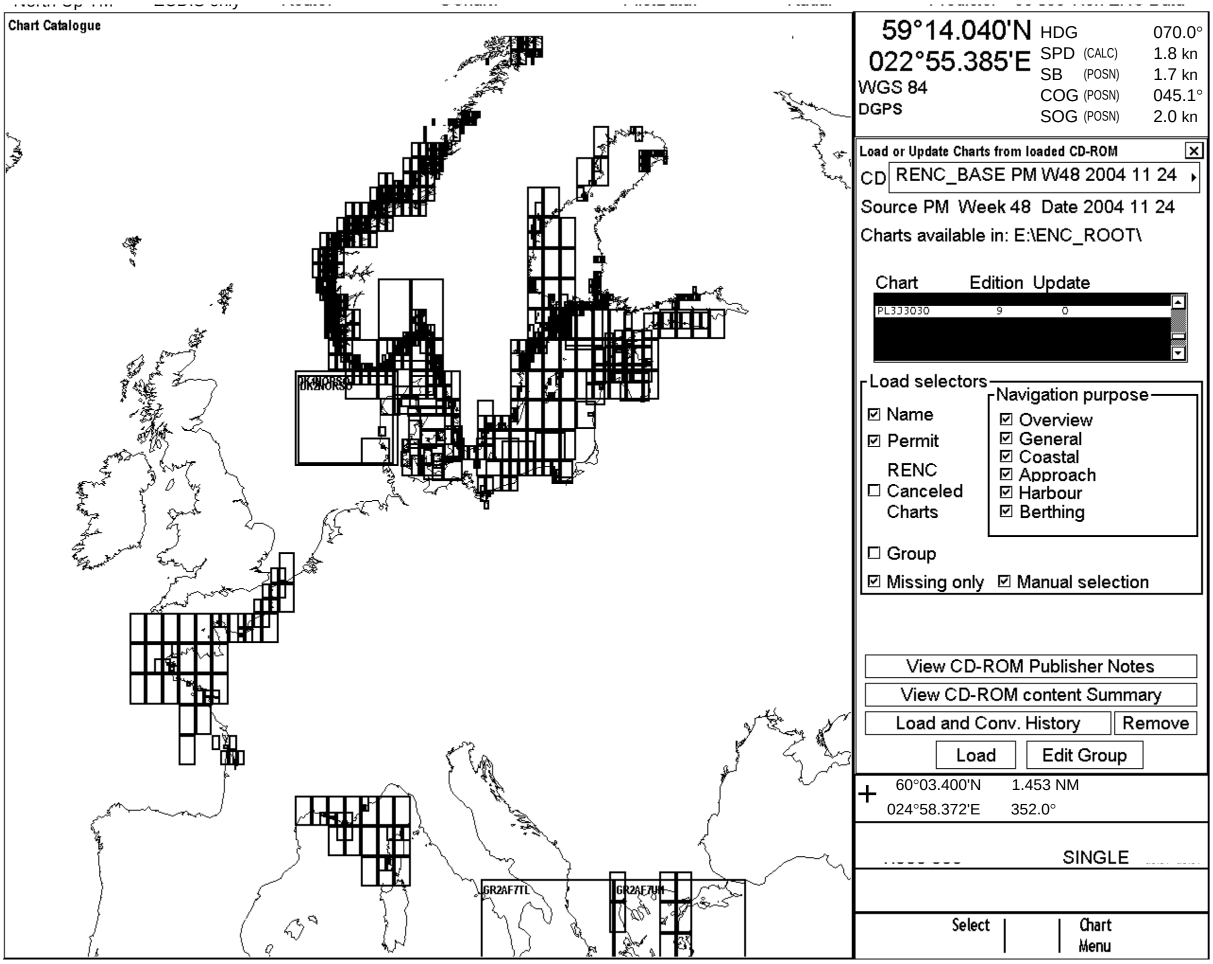



10. When conversion is completed, the following window appears.



### 7.7.5 How to view coverage of a base or update CD ROM from an RENC

Insert desired CD-ROM into CD-ROM drive. Select from Chart menu **Load or Update Charts** and next menu select **from CD-ROM.**



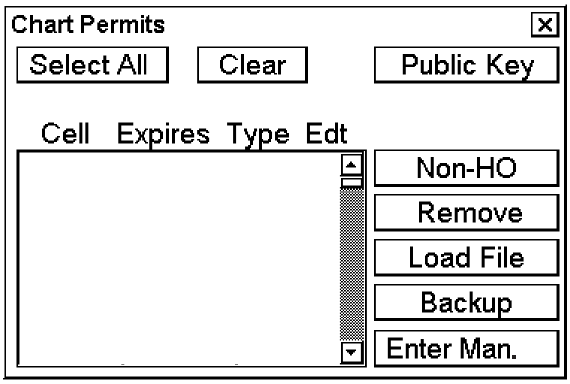

*Sample coverage area when a CD-ROM catalogue is from a Base CD-ROM from an RENC*

**Note:** remove selection "Missing only" to see total content of CD-ROM.

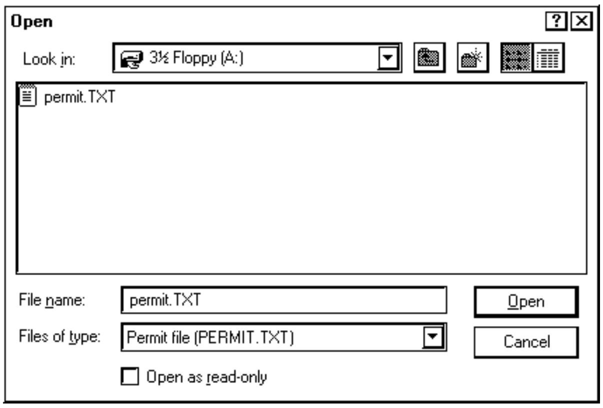
### 7.7.6 How to load an RENC-generated permit CD ROM or floppy disk

An RENC can deliver permits in a CD ROM or a floppy disk. When you receive new permits from an RENC, you have to load them into the chart radar. A permit is a key that is used to decrypt the chart you want to use in the chart radar. To load permits, do the following:

1. Choose Chart Permits from the Chart menu.



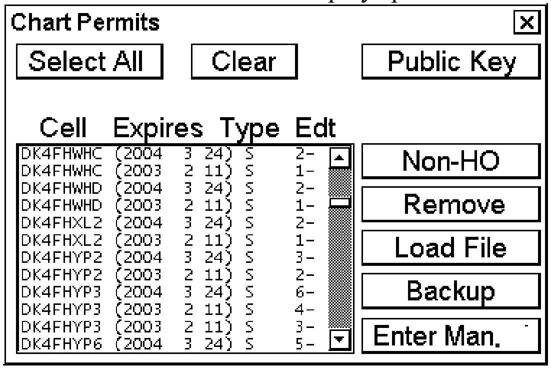

2. Click the **Load File** button.
3. Choose correct drive from the Look in list box.




Permits are available in two formats.

- **PERMIT.TXT** that contain permits and their editions and subscription types. This is the preferred format.
- *.PMT, received from an RENC, contain permits, but no edition or subscription information. Note that the *.PMT format is used by the system for backup of permits. As a backup it contain also subscription type and edition.
- Choose suitable permit file and click the **Open** button to load permits.

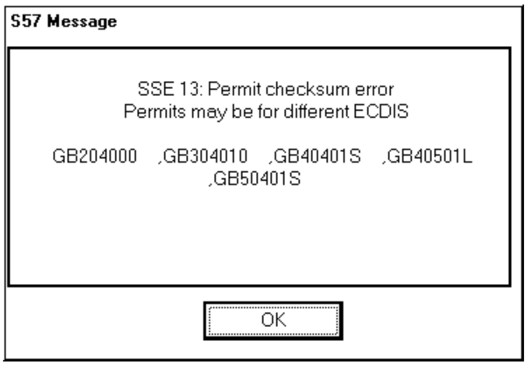
The Chart Permits window displays permits that are loaded into the chart radar.



### *Messages that may appear when loading a permit*

If you try to load a One-off permit for a chart for which you already have a Subscription permit, you get the following message:

If you load permits from a different chart radar, you get the following message:



# 7.8 RENC Security System

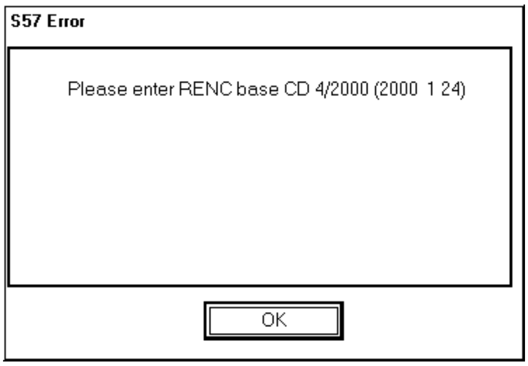
## 7.8.1 Standard messages in S57 chart load

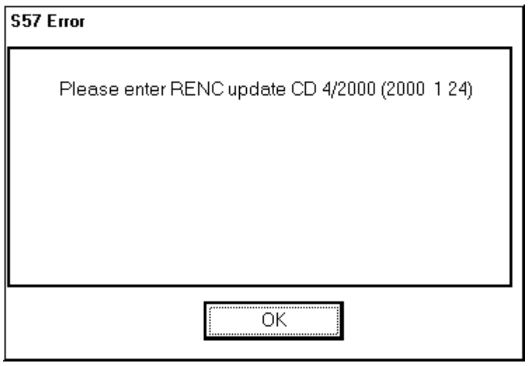
When loading S57 charts into the chart radar, messages appear to alert you to permits and authentication. These are described below and on the next several pages.

## 7.8.2 Additional messages in S57 chart load

### *Issue control of Base and Update CD ROM from RENC*

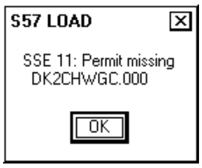
CD ROMs from an RENC contain issue control. If you later use a CD ROM catalogue created during loading of S57 charts, you get the following messages for a wrong CD ROM.




### *Messages that contain only notice*

If you tried to load charts for which you do not have a permit, you will get the following message:

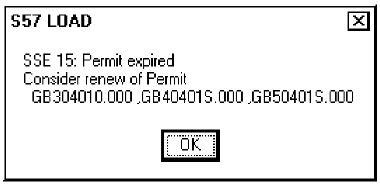


### *Messages that require careful attention*

All messages in this chapter change the legal status of the charts in your system.

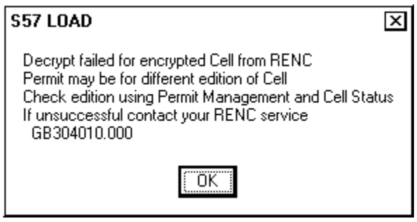
#### <u>You do not have a valid permit</u>

A chart was not converted into SENC because the permit for it has expired.




A chart was not converted into SENC because a permit is for a different edition.

You can check edition of the permit using the Chart Permits window in the Chart menu and the edition of the chart by using the Cell Status window.



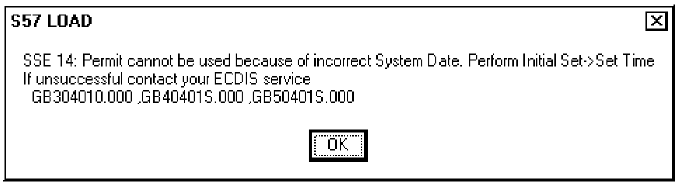

Typical reason is that the chart has been updated too many times as new edition instead of an update. Ask for new permits from your chart agent.

A chart was not converted into SENC because your permit was for different edition.

You can check edition of a permit using the Chart Permits and the edition of a chart using the Chart Cell Status window, both in the Chart menu.

The common reason for this message is that the chart has been updated too many times as new edition instead of update. Ask for new permits from your chart agent.

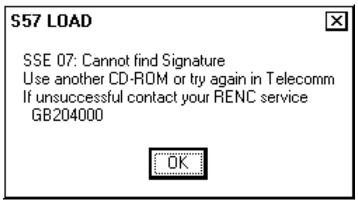
A chart was not converted into SENC because the software, data and system time in the chart radar indicates tampering.



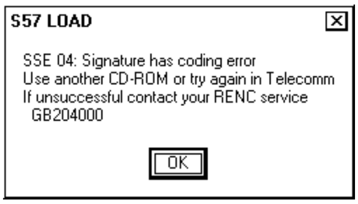

The common reason for this message is that RENC released a chart before the issue date of the chart.

**Authentication of chart failed**

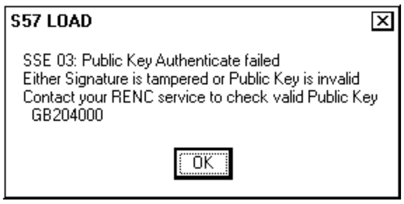
The chart was not loaded because of missing signature.



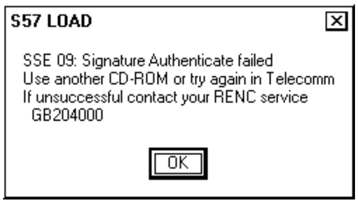

The chart was not loaded because of coding error in Signature.




The chart was not loaded because of tampered Signature or invalid Public Key.



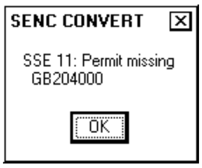

The chart was not loaded because of invalid or tampered Signature.




## 7.8.3 Additional messages in S57 SENC conversion

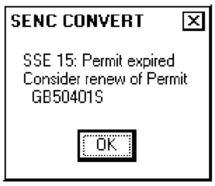
### *Messages that contain only notice*

You do not have a permit.



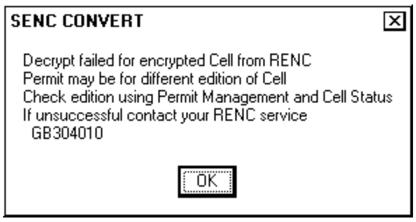

### *Messages that require careful attention*

Permit for a chart has expired.




You have a permit, but it is valid for another edition of the cell.

You can check edition of the permit using the Chart Permits window and the edition of a chart using the Cell Status window, both in the Chart menu.




A typical reason is that the chart has been updated too many times as a new edition instead of an update. Ask for new permits from your chart agent.

# 7.9 Vector Chart Display

## 7.9.1 How to select charts for viewing

### *Select a chart from a catalogue*

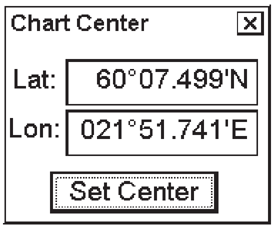
To choose a chart for viewing from a catalogue, do the following:

1. Choose Chart Catalogue from the Chart menu.
2. From the Chart Catalogue dialog box, use the cursor to choose desired chart. For further details, see section 7.4.2 Catalogue of S57 cells.
3. Click the **Open** button.

### *How to browse your charts*

You can view S57 charts using different positions and different scales. The basic tools for browsing charts are **Range -, Range+, Set Chart Center, ShipOffcenter** and **TM/CU Reset**.

**Set Chart Center** allows you to look ahead from a place other than your ship's current position. Spin the scrollwheel to display Set Chart Center/Info/Activate Scroll in the mouse functions area and then push the left mouse button. The dialog box shown below appears. Turn off automatic true motion reset by displaying and clicking TM Reset (in the mouse functions area). When true motion reset is off, the indication "Ship out of dsp" appears in the information area. Use the scrollwheel to set the latitude and longitude position for chart center then click the **Set Center** button.




To restore own ship's position to the screen center, display TM/CU Reset/Info/ShipOffcenter in the mouse functions area and then push the left mouse button.

**Range -** and **Range+** change the chart scale. If true motion reset is active, ZOOM IN and ZOOM OUT keep the relative position of your ship with respect to the display. If true motion reset is on, ZOOM IN and ZOOM OUT keep the relative position pointed by the cursor with respect to the display.

The system automatically chooses next larger or smaller scale. If a chart with larger compilation scale is available at your current viewing position, the message "Larger Scale Data Exists" appears.

### *How to look for charts around own ship*

You can use either true motion or relative motion. In the true motion mode, own ship moves until it reaches the true motion reset borderline, where it jumps back to an opposite position on the screen based on ship's course. In the relative motion mode, own ship stays in a fixed position, while the chart moves on screen.

If, in the true motion mode, you reset own position with TM/CU Reset, own ship will immediately jump to the true motion reset position.

If, in the true motion mode, you use ShipOffcenter, your ship will go to that position on screen and continue true motion movement from that position. When it reaches the true motion reset borderline, it will automatically jump to the true motion reset position.

If, in the relative motion mode, you reset own position with TM/CU Reset, your ship will immediately jump to the true motion reset position and use that position as fixed position to stay on screen.

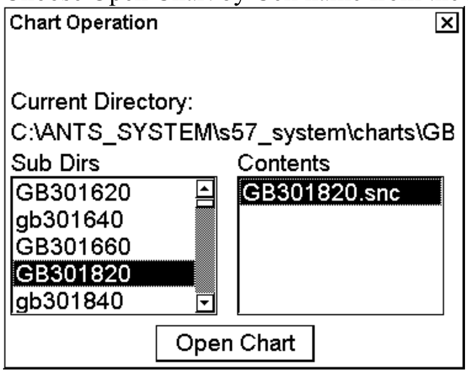
If you use relative motion, you can choose a new fixed position for your ship by using ShipOffcenter.

Use **Range -** and **Range+** to choose desired chart scale.

### 7.9.2 How to select a chart by its name

To activate a specific S57 chart cell onto the display, use Open Chart by Cell name menu in the Chart menu as follows:

1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area then push the right button.
2. Choose Open Chart by Cell name from the menu then push the scrollwheel.




3. Choose desired chart from the chart list dialog box then click the **Open Chart** button.

The chosen chart is automatically displayed in the electronic chart area.

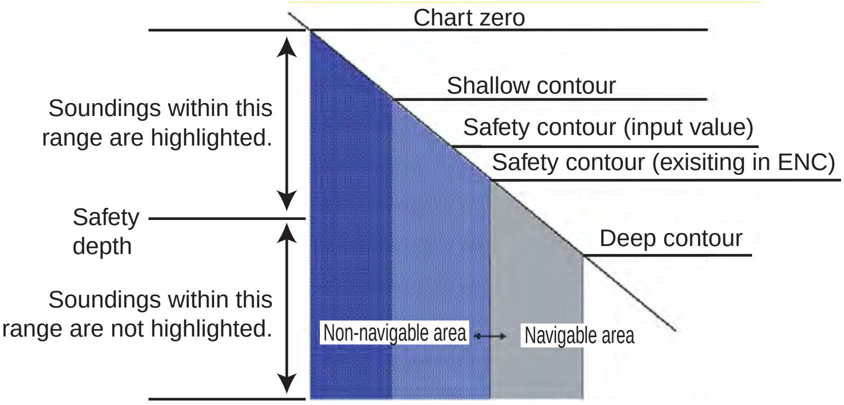
### 7.9.3 How to control visible chart features (chart display)

The Chart Display dialog box contains several pages of chart features that you may adjust as appropriate. To display this dialog box, spin the scrollwheel to show Chart Display/Info/Standard Display in the mouse functions area and then push the left mouse button.

#### *How to set value for Shallow Contour, Safety Depth, Safety Contour and Deep Contour*

You can set values for Shallow Contour, Safety Depth, Safety Contour and Deep Contour. This can be done on Chart page of the Chart Display dialog box. Colours used for depth presentation on the electronic chart are controlled by setting values for Shallow Contour, Safety Depth, Safety Contour and Deep Contour. Soundings on the electronic chart, which are equal to or less than the value of Safety Depth, are highlighted. See below pictures for multi-colour presentation and two-colour presentation. Selection of multi- and two-colour presentations can be done by selecting from list box of "Depths" on Chart page of Chart Display.

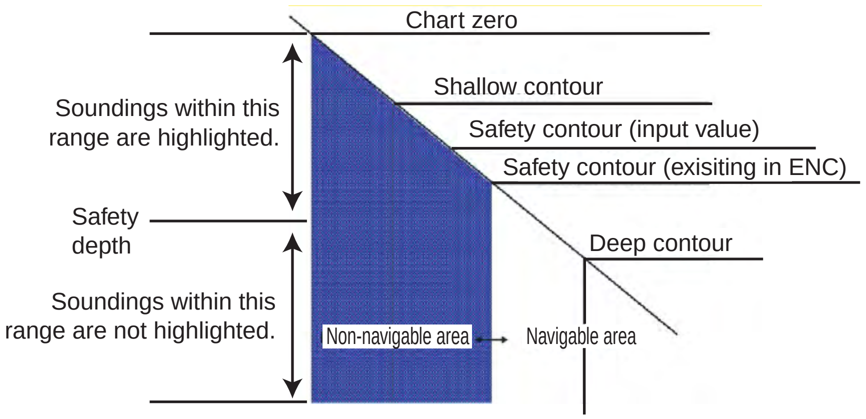
**MULTI-COLOUR presentation**




In the multi-colour presentation four colours are used for depths. If input Safety contour does not exist in electronic chart, system selects automatically next available deeper depth contour as Safety contour. For example input value is 8 m, but there is no 8 m depth contour in electronic chart, the system automatically selects next available deeper depth contour (10 m) as Safety contour. Depth contour value of 10 m is presented as Safety Contour in this electronic chart.

Shallow contour is for possible visual color change inside the unsafe water area. Unsafe water area is all shallower than "safety contour". Set value of Shallow Contour less than value of Safety contour. For more information about color change, see below selection of "Depths".

**TWO-COLOUR presentation:**




In the two-colour presentation unsafe water is shown as blue colour and safe water shown as white colour. The safety contour is used to qualify unsafe water (depth shallower than safety contour) and safe water (depths deeper than safety contour).

If input Safety contour does not exist in electronic chart, system selects automatically next deeper available depth contour as Safety contour. For example input value is 8 m, but there is no 8 m depth contour in electronic chart, system selects next deeper depth contour (10 m) as Safety contour. Depth contour value of 10 m is presented as Safety Contour in this electronic chart.

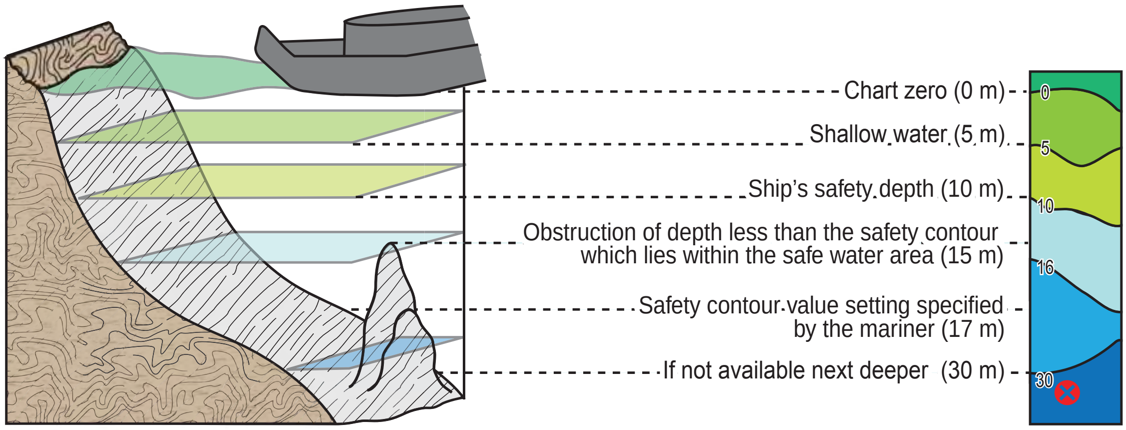
***Anti-grounding function***

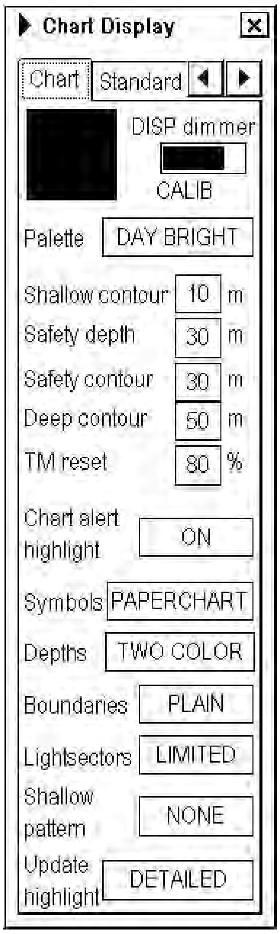
The figure displays the different water depth limits for the navigation by ENC in ECDIS. The ship's navigator can individually adjust the warning time before reaching such limit line.

The following settings are possible:

**Safety depth**: A defined water depth, e.g. the draught and underkeel clearance, which are used by ECDIS to display water-depths, which are equal or lower as the depth defined.
**Safety contour**: A defined water-depth area, which is used by ECDIS to differentiate between safe and unsafe water-depth and to generate an anti-grounding alarm before the ship is passing the line.

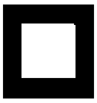
If the ENC data do not provide the chosen depth-lines, the system automatically uses the next deeper available depth-line as reference.






### Chart page

**Black and grey color symbol:**



This symbol is used to verify that you can distinguish black (frame of symbol) and grey (inner part of symbol) colors with current contrast and brilliance settings.

**DISP dimmer:** Use this control to adjust dimming of display. Text "CALIB" indicates that dimming of display is set within calibration values.

**Palette:** Choose appropriate palette for the display depending on the brightness of the bridge.

**Shallow contour:** Set value of shallow water contour. For more information, see the section How to set value for Shallow Contour, Safety Depth, Safety Contour and Deep Contour on the preceding page.

**Safety depth:** Set value of safety depth. Spot soundings below the safety depth are highlighted.

**Safety contour:** Set value of safety contour. Visible safety contour is equal to set value or if the contour of set value is not available then the visible safety contour is next deeper contour than safety contour. For more information, see the section How to set value for Shallow Contour, Safety Depth, Safety Contour and Deep Contour on the preceding page.

**Note:** The system uses safety contour also for chart alerts.

**Deep contour:** Set deep water contour. For more information, see the section How to set value for Shallow Contour, Safety Depth, Safety Contour and Deep Contour on the preceding page.

**TM reset:** In the true motion mode, own ship moves until it reaches the true motion reset borderline (set here), and then it jumps back to an opposite position on screen based on its course. Set the limit for TM reset (in percentage). Appears in the ECDIS mode only.

**Chart alert highlight:** Set chart alert highlight. For more information, see section 9.1.3 How to highlight chart alert areas.

**Symbols:** Select how to display chart symbols. The options are:

**Simplified:** The shape of symbols is of modern design and the sea mark symbols are filled in a color.

**Paper Chart:** The shape of symbols imitates traditional symbols used in paper charts.

**Depths:** Set how to display different depth zones on the chart display. For more information, see the section How to set value for Shallow Contour, Safety Depth, Safety Contour and Deep Contour on the preceding page.

**For MULTI COLOUR**, the chart display uses four different colors for contours:

- Deeper than user-chosen deep contour
- Between deep contour and user-chosen safety contour
- Between safety contour and user-chosen shallow water contour
- Between shallow water contour and coastline.

**For TWO COLOUR**, the chart display uses only two colors:

- Deeper than safety contour
- Shallower than safety contour

**Boundaries:** Set how to display boundaries of some chart features. The options are:

**Plain:** The line styles are limited to plain solid and dashed lines.

**SYMB.:** Some of the line styles use symbols to highlight the purpose of a line.

**Lightsectors:** Set how to display light sectors. The options are:

**Limited:** The length of a light sector is fixed at 25 mm independently of the displayed scale.

**Full:** The length of a light sector represent its nominal range as defined by the chart producer.

**Shallow pattern:** Set how to display shallow water area. The options are:

**None**

**Diamond:** Provided to distinguish shallow water at night.

**Update Highlight:** Set how the updates are highlighted on the screen before they are approved by the user. The options are

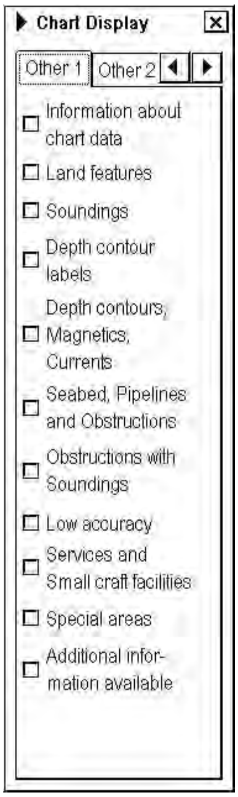
**Detailed:** The system tries to highlight updates so that only those objects that have visible changes are highlighted. Use this option to see the practical change of an update.

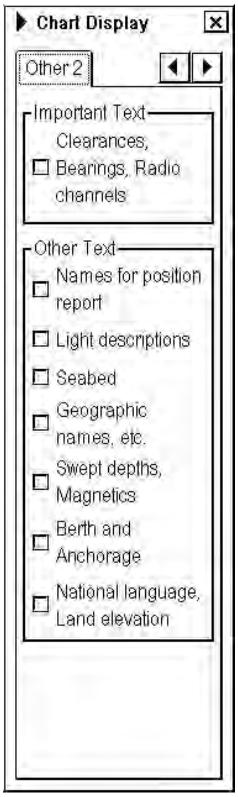
**All effects:** The system highlights updates so that all the objects pertaining to updates are highlighted although some of them have not been changed.

### *"Standard, Other 1 and Other 2" pages*

The Standard page contains chart features defined by IMO that comprise a standard display. You can recall the standard display at any time using a single action, by displaying Chart Display/Info/Standard Display in the mouse function area and pushing the right mouse button.

The Other 1 and Other 2 pages contain chart features for which you can control visibility and that are not part of IMO-defined standard display.




**Note 1:** To use the Info request feature, which provides information for cursor-chosen chart feature, the associated chart feature must be turned on from the Standard page.

**Note 2:** To navigate between the pages in the Chart Display dialog box, click the appropriate arrow tab with the left mouse button or hit the **NEXT** key on the Control Head RCU-018.

### 7.9.4 Display base

A subset of chart features is called the Display Base. As required by IMO, these features cannot be made invisible. The Display Base consist of the following chart features:

- Coastline (high water)
- Own ship's safety contour, which is chosen by the user
- Indication of isolated underwater dangers of depths less than the safety contour that lie within the safe waters defined by the safety contour
- Indication of isolated dangers that lie within the safe water defined by the safety contour such as bridges, overhead wires, etc., and including buoys and beacons whether or not these are being used as aids to navigation.
- Traffic routine systems
- Scale, range, orientation and display mode
- Units of depth and height

### 7.9.5 How to control visible navigation features (Symbol display)

Visibility control of the navigation features is divided into five pages in the Symbol Display dialog box. The "Route" page controls planned and monitored route. The "Tracking" page controls past tracks and some other features. The "Mariner" page controls Notes and user charts. The "Targets" page controls TT and AIS targets. The "General" page controls own ship and target related things.
The user can define settings for chart details that are displayed over the chart area.

#### Route page

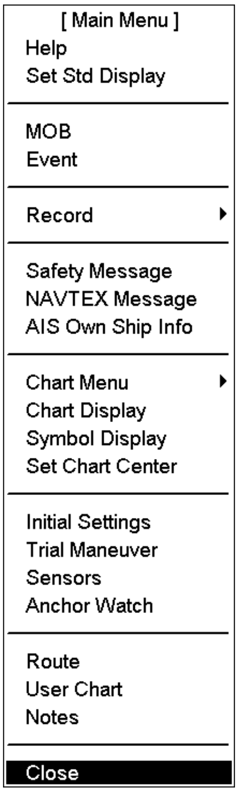
This page contains selection of route related navigation features

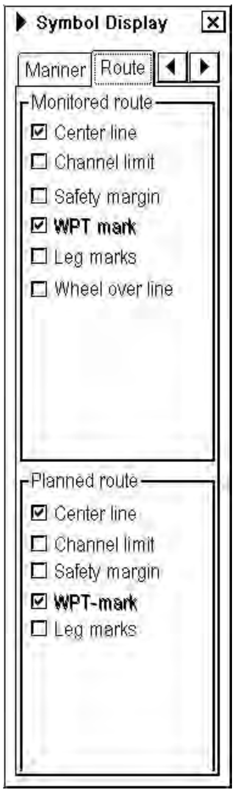
**Monitored route:** Choose which part of monitored route to display.

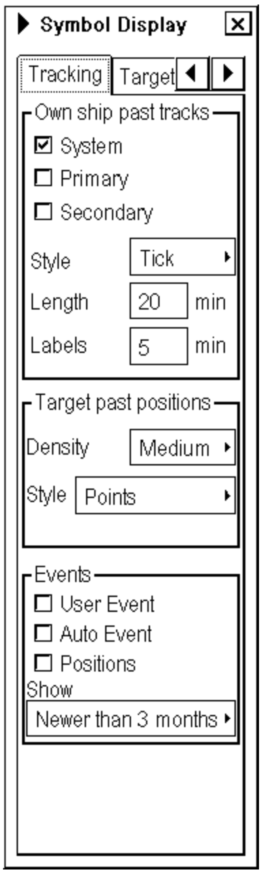
**Planned route:** Choose which part of planned route to display.

**Note:** WPT mark on both monitor and planned routes is set permanently to Std position.

Open Main menu and select Symbol Display from the menu.






### *Tracking page*

**<u>Own ship past tracks</u>**

**System:** Check to plot own ship's tracks using system-fed position.

**Primary:** Check to plot own ship's past track with position fed from the primary sensor.

**Secondary:** Check to plot own ship's past track with position fed from a secondary sensor.

**Style:** Select time stamp position for past track (indicated by Tick or Point)

**Length:** Select length of past track

**Labels:** Select label interval.

**<u>Target past positions</u>**

**Density:** Select density of past position of points.

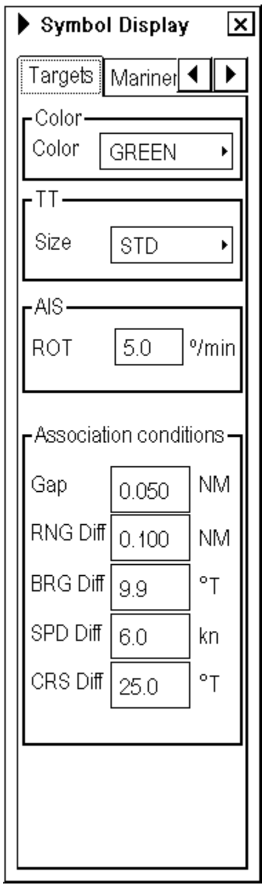
**Style:** Select style of presentation of target's past position.

**Events:** These marks are based on voyage log records.

**User Event:** Display event symbols on ECDIS, where the system has recorded an event based on conditions you have set (Type: User and Auto).

**Auto Event:** Display automatically entered event symbols, where the system has recorded an event based on conditions you have set (Type: Ship and Alarm).

**Positions:** Display the latitude and longitude of an event.
**Note 1:** MOB event is visible always.
**Note 2:** You can choose period of time to display event marks in the list box "Show".




### *Targets page*

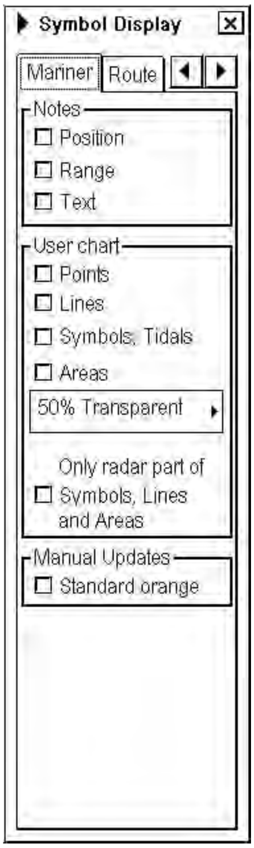
**Color:** Select color of target from the list box

**TT:** Std or small for TTs.

**AIS:** ROT (°/min), limit to display AIS target with curved speed vector. Note, source of ROT must be ROT gyro on target vessel.

**Association conditions:** Set appropriate conditions for TT and AIS association for:

- Gap
- RNG Diff
- BRG Diff
- SPD Diff
- CRS Diff




### *Mariner page*

**Notes**

**Position:** Check to show positions of Notes records with symbols on the chart.

**Range:** Check to circumscribe pilot data records with circles on the display. The size of a circle depends on the value set in Notes.

**Text:** Check to show text of Notes records on the chart.

**User chart**

**Points:** Check to show user points on user charts.

**Lines:** Check to show lines on user charts.

**Symbols, Tidals:** Check to show symbols and tidals on user charts.

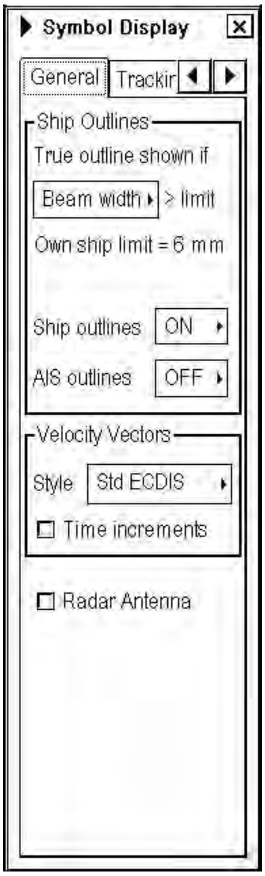
**Areas:** Check to show areas on the display. Color fill for the areas can be chosen as transparent from 25 to 75% and as No color fill. If No color fill is chosen, only the boundaries of the areas are visible.

**Only radar part of Symbols, Lines and Areas:** Check to display only those Lines, Symbols and Areas that have user selection "on radar" activated for them in the user chart. This is used to view only that part of the user chart that will be sent to the radar connected to the system.

**Manual Updates**

Select to show manual updates with orange symbols.

**Note:** Visibility of manual updates made as true symbols are controlled through Standard and Other pages of the Chart Display menu.




### *General page*

**Ship Outlines**

**Ship outlines:** Select OFF or ON to show minimized or scaled symbol, respectively.

True outline shown if:

(Beam width>6mm / Length>6mm), you can set whether width or length is used to set limit for displaying true symbol.

**AIS outlines:** Select OFF or ON to show AIS targets in same size or scaled symbol, respectively.

**Velocity Vectors**

**Style:** Select vector style, Conventional (simplified symbol), Std ECDIS (minimized symbol).

**Time Increments:** Check to show ticks of velocity vector.
**Note:** This controls both own ship and targets ticks. If ticks are too tightly spaced, they will be automatically removed from the display, until spacing between ticks is sufficient to distinguish them separately. This depends on display scale and speed of vessel/target.

**Radar Antenna**

Check to mark position of radar antenna (with "x".

## 7.9.6 How to store and recall chart display setting for visible chart and navigational features

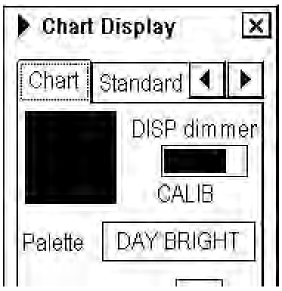
Chart display settings and Symbol display settings are using common settings, which means that when you select settings display settings the same file is chosen for symbol settings.

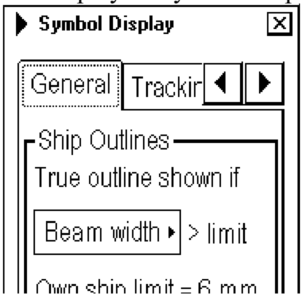
You can define chart display and symbol display settings that are displayed over S57 charts cells. You can save these chart display settings to your hard disk and recall them whenever you need them.

### *How to create new chart display settings*

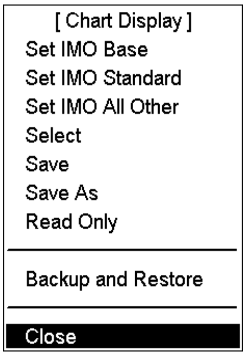
To create new settings for chart display, do the following:

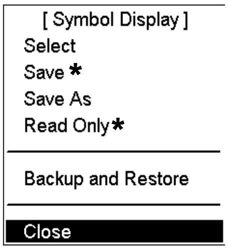
1. Display Chart Display/Info/Standard Display in the mouse functions area and then push the left mouse button.
2. Put the cursor on the small triangle on the Chart Display or Symbol Display dialog box.



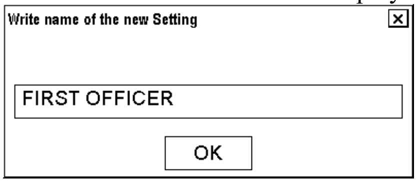

3. Choose "Save as" from the Chart Display or Symbol Display menu and then push the scrollwheel.




*** Appears when user-created file is selected.**

4. Enter desired name for Chart Display Settings and press **OK** in the dialog box.




5. Make your changes both Chart Display and Symbol display settings. Note, that you have to select "Save" from the menu before closing the dialog box.

### *How to select chart display settings*

1. Open the Chart Display or Symbol Display dialog box and put the cursor on the triangle.
2. Choose Select from the menu and push the scrollwheel.
3. Choose desired chart display settings from the list box.

### *How to save changes to chart display settings*

1. Open the Chart Display or Symbol Display dialog box and put the cursor on the triangle.
2. Choose Save from the menu to save current chart display settings.

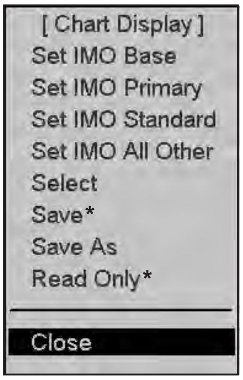
### 7.9.7 Control of predefined IMO Chart Display Settings

There are three sets of predefined Chart Display Settings that can be used to display Charts with certain chart features. The predefined Chart Display Settings are called as:

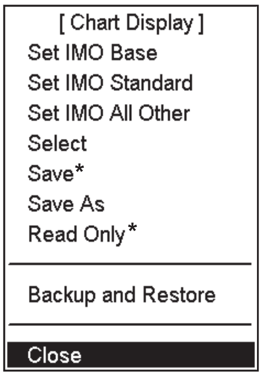
- IMO-Base
- IMO Primary (Only in Chart Radar mode)
- IMO-Standard
- IMO-All Other

You can find display setting in use on upper status bar. For more information, see section 6.1 ECDIS Overview.

To select desired IMO Chart Display Settings, proceed as follows:




*Menu in chart radar mode*




*Menu in ECDIS mode*

** Appears when user-created file is selected.*

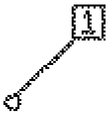
1. Open CHART DISPLAY window and move cursor over black triangle on Chart Display window, press left mouse button.
2. Choose **Set IMO Base, Set Imo Standard or Set IMO All Other** from the menu.

# 7.10 Sailing Directions, Tidal Tables, etc., Features of Vector Charts

Vector charts contain sailing directions, tidal tables and other textual and picture information that are not immediately visible on the chart. This information forms an integral part of the legal ENC chart that can fulfil SOLAS requirements. As a navigator you should check them as well as you check the visible chart when you do your planning and when you perform navigation.

Because these features are not permanently visible on the chart as they used to be in case of a paper chart, the chart radar has special symbols to highlight the locations from which you can use the Info request to know additional information about the above-mentioned features. Below are examples of these symbols. For further details, see section 7.13 How to Request Information About Vector Chart Objects.

A grey box is used to show that Tidal information is available for Info request by cursor pick.
**Note:** The visibility of the grey box symbol is controlled by the item "Depth contours, magnetics, currents" in the Other 1 page of the Chart Display dialog box.




A magenta-colored symbol is used to show that additional textual or picture information such as sailing directions are available from Info request by cursor pick.
**Note:** The visibility of the magenta symbol is controlled by the item "Additional information available" in the Other 1 page of the Chart Display dialog box.

# 7.11 Chart Viewing Dates and Seasonal Features of the Vector Chart

## 7.11.1 Introduction

Vector charts contain date-dependent features. Updating in general, including reissues, new editions and updates, creates date dependency. In addition to the obvious date dependency, some features of the S57 charts create additional date dependency. These features include "Date Start", "Date End", "Seasonal date start" and "Seasonal date end". Hydrographic Offices use these features to publish Temporary and Preliminary Notices to Mariners, as their paper chart equivalent updates are called. For further details see section 7.11.5 About chart viewing date dependency of S57 standard.

You can efficiently use chart viewing date dependency to use the valid data for any given date applicable for your navigation or planning purposes. For example, you can check for existence of changes and restrictions weeks before they became valid. Date dependency is a part of the new electronic method to keep your chart up-to-date and valid for your intended use. Normally you should set Display Until and Approve Until once per week to keep your chart up-to-date.

**Note:** When you load charts and their updates into your system, the Display Until date is set as current date of the system. You must set the Approve Until date yourself. Make sure that you have set Display Until and Approve Until dates to the current date or to your planning date, whichever is applicable to your current usage of charts. For details on how to set Display/Approve date, see section 7.11.2 How to approve and highlight vector chart updates. If the charts you are currently using have Display Until and/or Approved Until set more than 1 week from current system date, you will you get the Permanent message on your chart display.

**Permanent message**

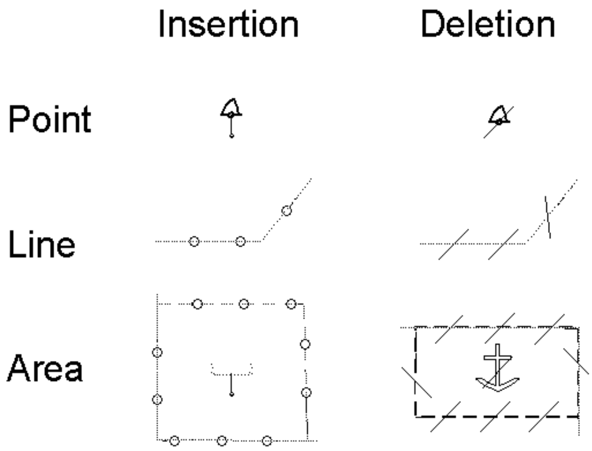
At least one of used charts has more than one week between "Approved Until" and/or "Displayed Until" and current system date. Use Chart Menu-Set Chart viewing dates.

## 7.11.2 How to approve and highlight vector chart updates

Before you approve updates, you can display (highlight) updates that are included into S57 charts. Normally you have chosen "Automatic Display Until" after the SENC conversion. In this case, after all the SENC conversions have been finished, all updates are automatically highlighted and you can view and approve them after viewing. For further details, see section 7.11.4 How to set "approve until" date.

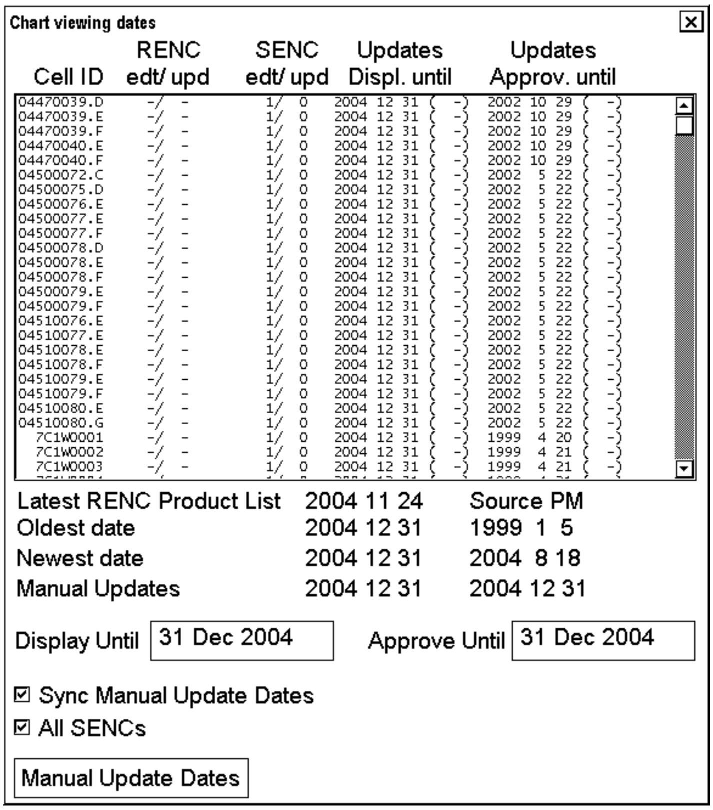
If you want to review updates after the initial approval of the updates do the following:

1. Use Approve Until to set the begin date for the update highlight. See section 7.11.4 How to set "approve until" date.
2. Use Display Until to set the end date for the update highlight. See section 7.11.3 How to set "display until" date.
3. Review the changes. Added features are highlighted with orange circles. Removed features are highlighted with orange slashes. Changed features are highlighted with both orange circles and slashes. See the picture at right.
4. After reviewing, set Approve Until and Display Until back to the current system date.



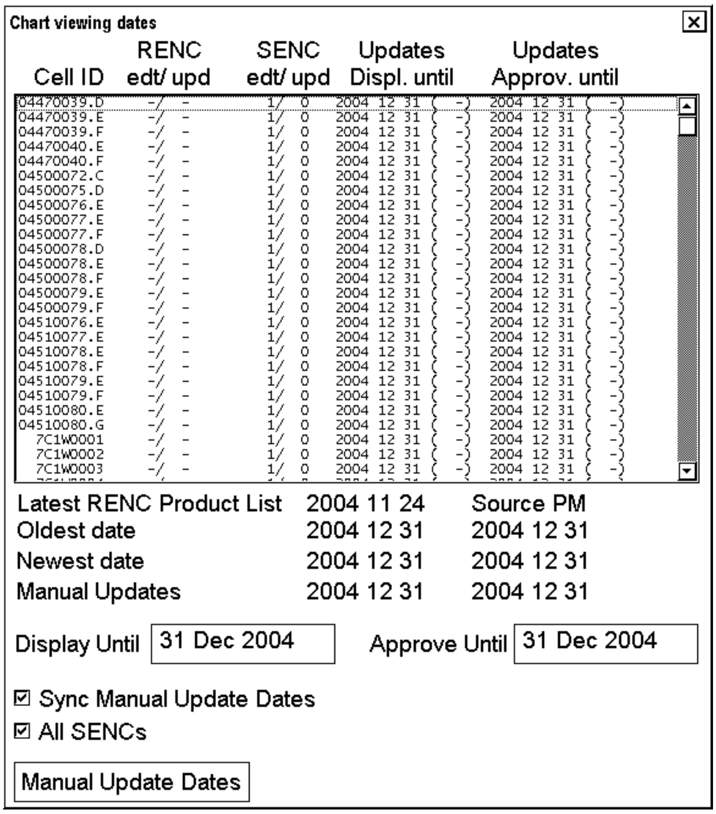
## 7.11.3 How to set "display until" date

1. Open the Chart menu.
2. Choose Set Chart viewing dates from the menu.
3. Set the cursor in the Display Until field, use the scrollwheel to set desired date, and confirm by pushing the scrollwheel.




## 7.11.4 How to set "approve until" date

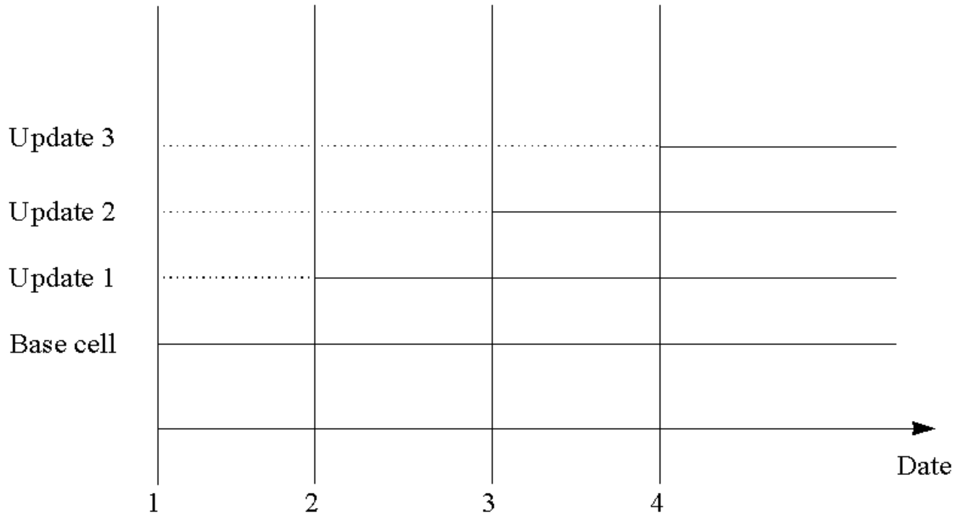
1. Open the Chart menu.
2. Choose Set Chart viewing dates from the menu.
3. Set the cursor in the Approve Until field, use the scrollwheel to set desired date, and confirm by pushing the scrollwheel.



## 7.11.5 About chart viewing date dependency of S57 standard

### *How the issue date of updates changes the visibility of the changes*

Study the example below to understand the behavior of updates relative to date.




The figure above shows how updates are dependent Chart viewing dates set in Display/Approve date settings by user. Actions 1 to 4 areas as follows:

1. Base cell including three updates is converted into SENC. Display date is set as current date of the system. Approve date has to be set to current date.
2. The date in which update 1 was issued. Display and Approve dates have to be set to correct date in order to see the chart with update 1.
3. The date in which update 2 was issued. Display and Approve dates have to be set to correct date in order to see the chart with update 1 and update 2.
4. The date in which update 3 was issued. Display and Approve dates have to be set to correct date in order to see the chart with update 1, update 2 and update 3.

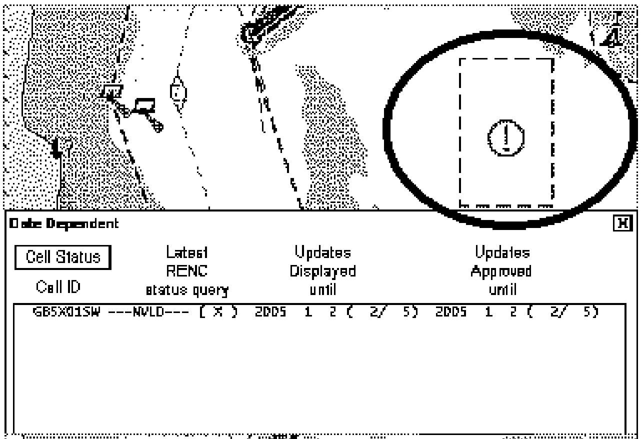
**Note 1:** In order to display charts with correct updated situation, **always** use current date during your voyage. If your voyage lasts more than one week, set current date at least once per week during your voyage.

**Note 2:** In order to display charts with correct updated situation during route planning, always use planned date of each waypoint to check your plan.

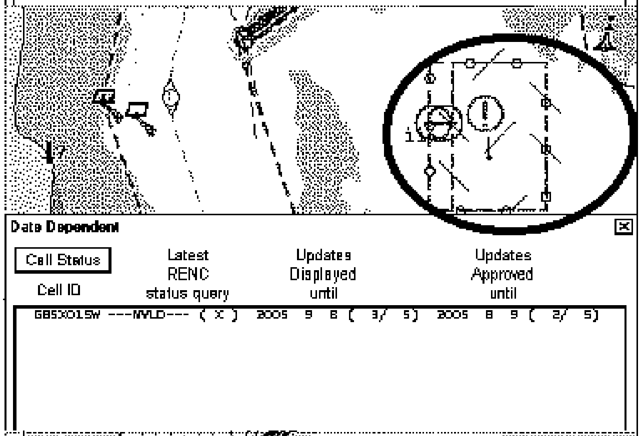
### *How temporary and preliminary notices to mariners behave with vector charts*

In some cases the producer of a chart (Hydrographic Office) is aware of changes that will happen in the future. A Hydrographic Office is able to include this kind of update into the chart for later use. In the paper chart world, these changes are published in Preliminary and Temporary Notices to Mariners.

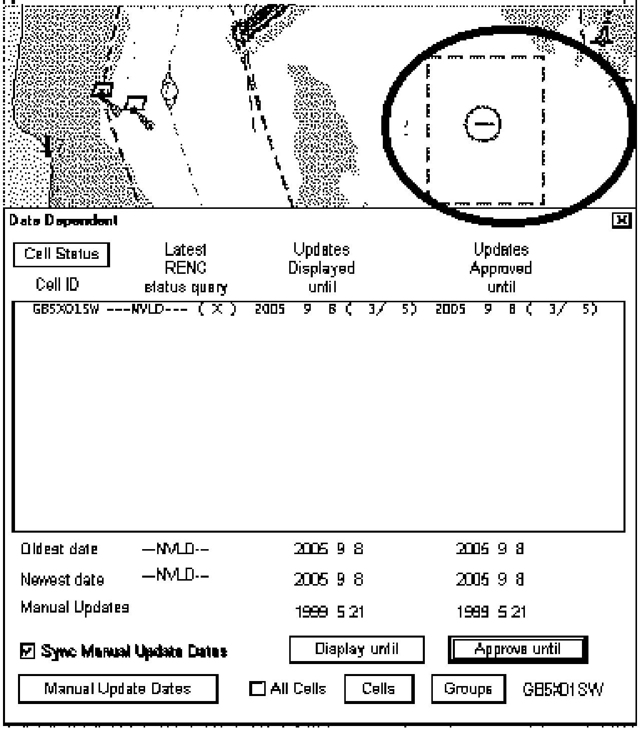
**<u>An example of changes known to happen in the future</u>**




Display/Approve date is set to 2005-01-02.
You can see a box-shaped Caution area on the screen.




Display date is now set to 2005-09-08 and Approve date is 2005-9-09.
You can see a new area (Restricted Area) inserted into existing area (Caution Area).



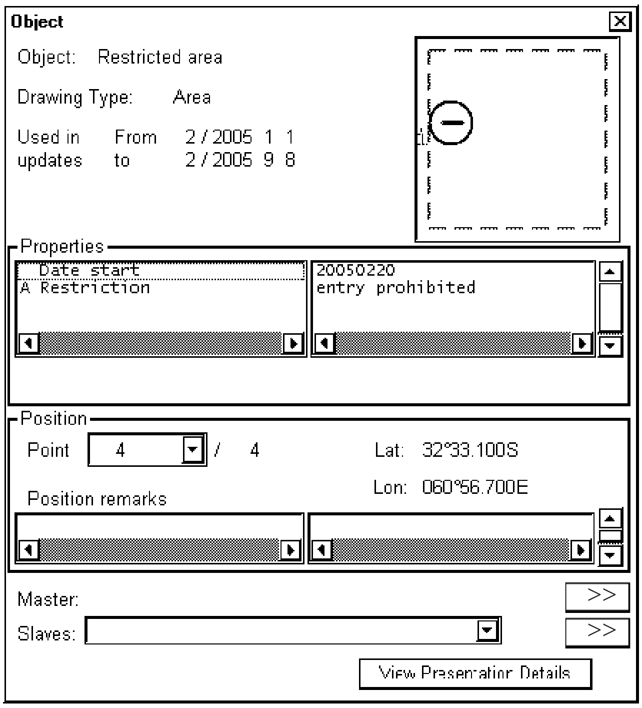

Display/Approve data is set to 2005-09-08.
You see only a Restricted Area without any Caution Area.

### *How seasonal features are coded in vector charts*

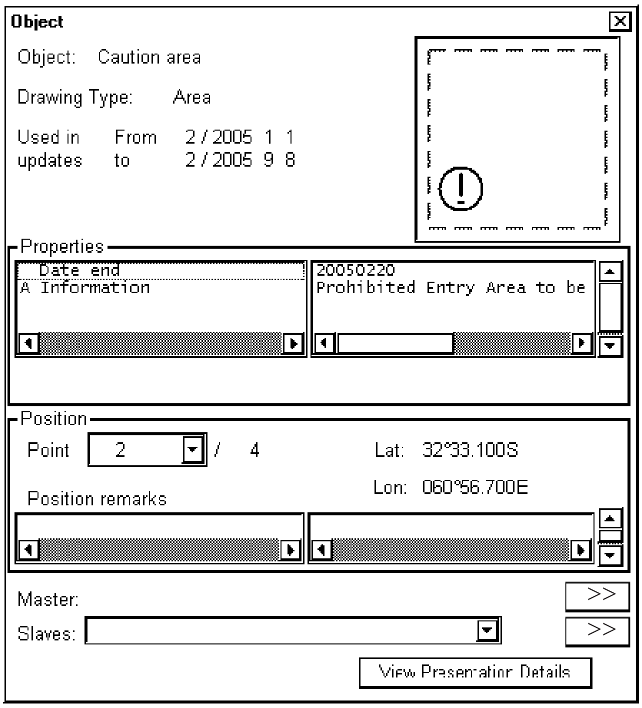
Some chart producers may define a chart feature to use seasonal date start and end as shown below.

- YYMMDD (Full date for date start and date end)
- --MMDD (The same date every year)
- --MM (The same month every year)

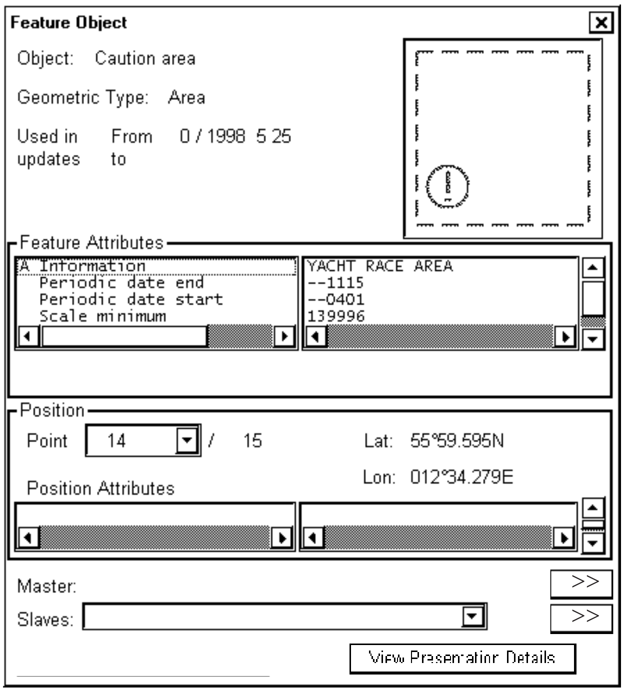
The example below shows how a user can find, using Info query (seasonal), the full date for starting date (YYYYMMDD).



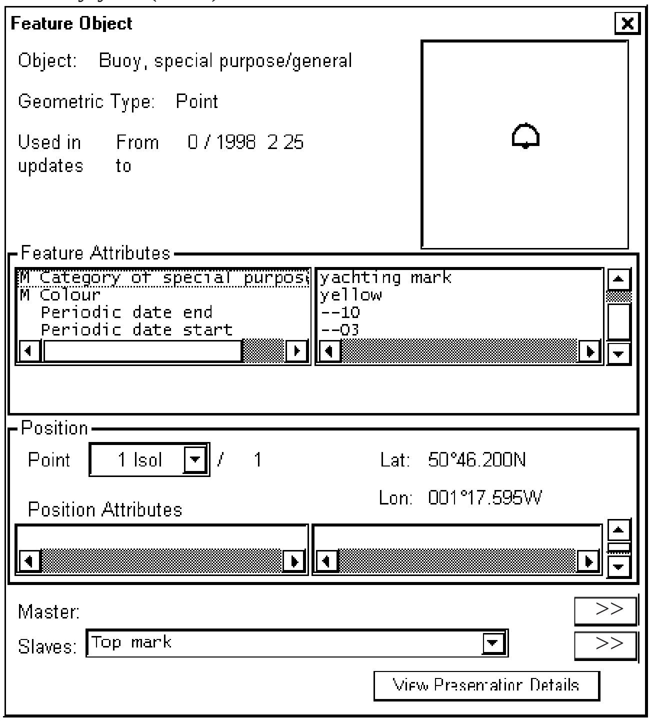

The example below shows how a user can find, using Info query (seasonal), the full date for ending date (YYYYMMDD).



This example shows how a user can find, using the Info query (seasonal), the starting and ending month and day in every year (-MMDD).

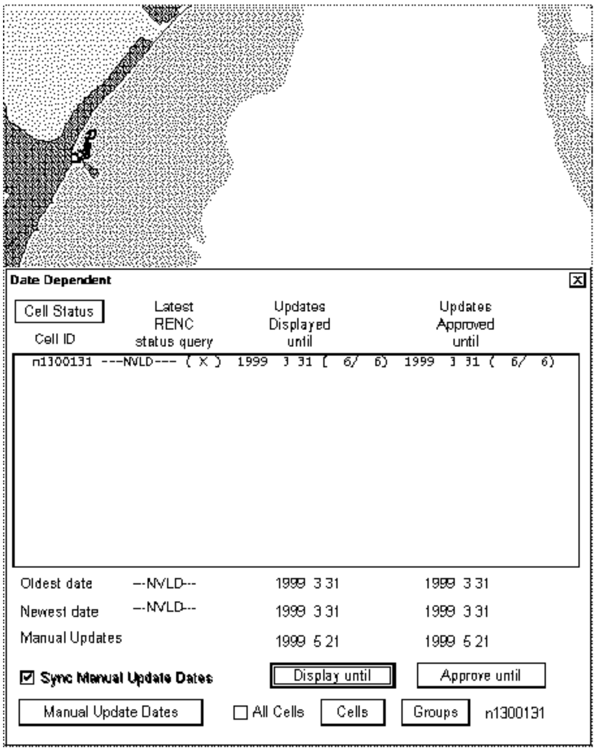



This example shows how a user can find, using the Info query (seasonal), the starting and ending month and day in every year (-MM).

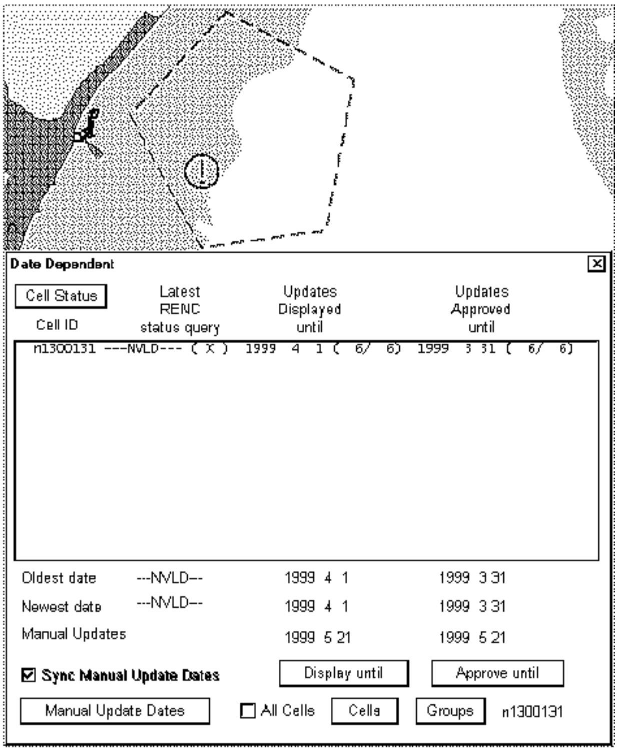


## An example of a seasonal chart feature

The next two figures show a caution area that is valid from April 1 to November 15.

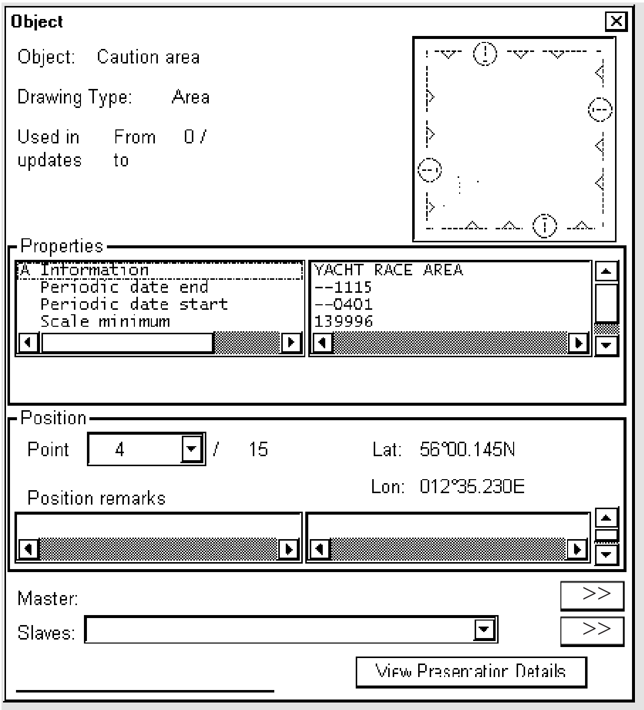



Display/Approve date has been set to to 1999-3-31.
Caution Area is NOT displayed because the date is NOT valid for displaying it.




Display date has been set to to 1999-4-1.
Caution Area is displayed because the date is valid for displaying it.

The figure below shows the attributes of the caution area in the example above, in the Info request window.



## 7.12 Symbology Used in Vector Charts

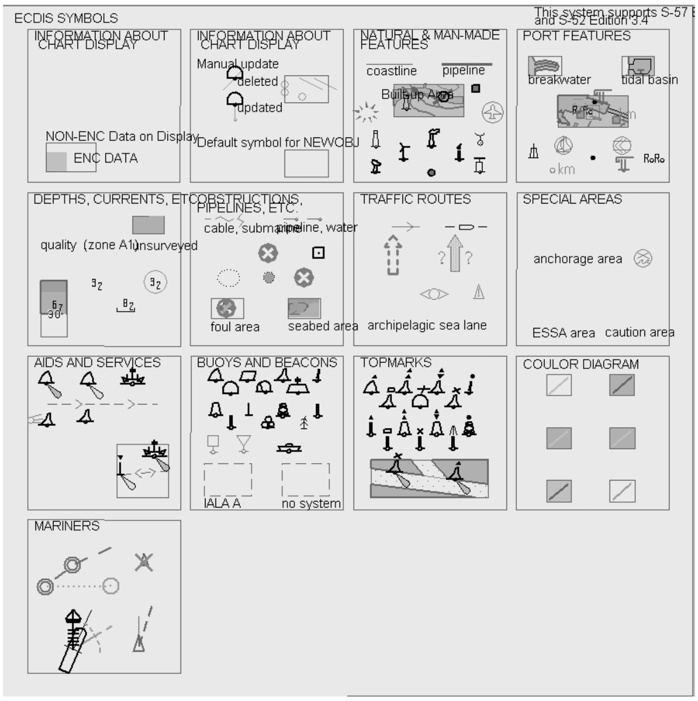
You can familiarize yourself with the symbology used by browsing IHO ECDIS Chart 1, which is included in this chart radar. Note that it behaves as any S57 chart and it follows your selections. See section 7.9.3 How to control visible chart features.

You can familiarize yourself with the symbology used by browsing IHO ECDIS Chart 1, which is included in this ECDIS. Note that it behaves as any S57 chart and it follows your selections. See section 7.9.3 How to control visible chart features.

1. Open the Chart menu.
2. Choose ECDIS Chart 1 from the menu then push the scrollwheel.
3. Choose desired chart symbols from the submenu to show on the ECDIS.

Appendix 2 contains examples of plots with symbols.

The Return dialog window appears when you choose something from the submenu of ECDIS Chart 1. When you close the Return dialog window, by clicking the X at the upper right corner, ECDIS Chart 1 will be closed and normal chart presentation is displayed.




*An example of Overview chart*

### 7.12.1 How to change presentation library used for vector chart features

The chart radar uses the official IHO presentation library to draw vector charts. The presentation library is replaceable, but this feature is only intended to be used by qualified service personnel and type approval authorities.

When this manual was published the official presentation library was "pslb03_2.dai", known as "Official IHO presentation library for chart radar Ed 3 revision 1, Edition: 3.2".

# 7.13 How to Request Information About Vector Chart Objects

The ability to cursor-pick an object to find additional information about the object is an important function of the chart radar. However, an unprocessed cursor pick, which does not discriminate or interpret and merely dumps on the interface panel all the information available at that point on the display, will normally result in pages of unsorted and barely intelligible attribute information.

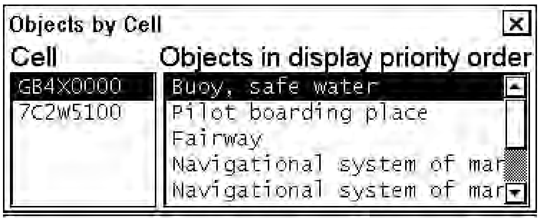
## 7.13.1 How to set visible vector chart features

The request information about S57 chart objects is given only to objects that are chosen for display by the user. For how choose chart details to display, see section 7.9.3 How to control visible chart features (chart display).

## 7.13.2 How to select desired object from the list of found objects

To specify desired SENC and object for information request, do the following:

1. Put the cursor on object desired.
2. Push the scrollwheel. Two windows appear: Objects by Cell and Object.
3. Use the Objects by Cell window to choose desired chart cell and desired object from which you need information.
   If there are different navigation purpose S57 charts over the area where you are making an information request, you can choose desired S57 chart cell from the Cell window. A list of S57 chart cells is displayed in the Cell list box. Choose desired S57 chart cell from the list.




*ECDIS mode*

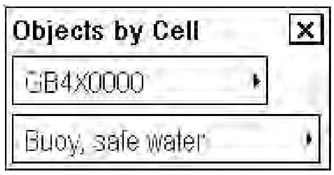
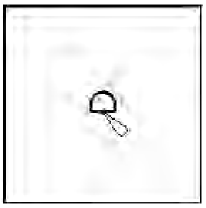
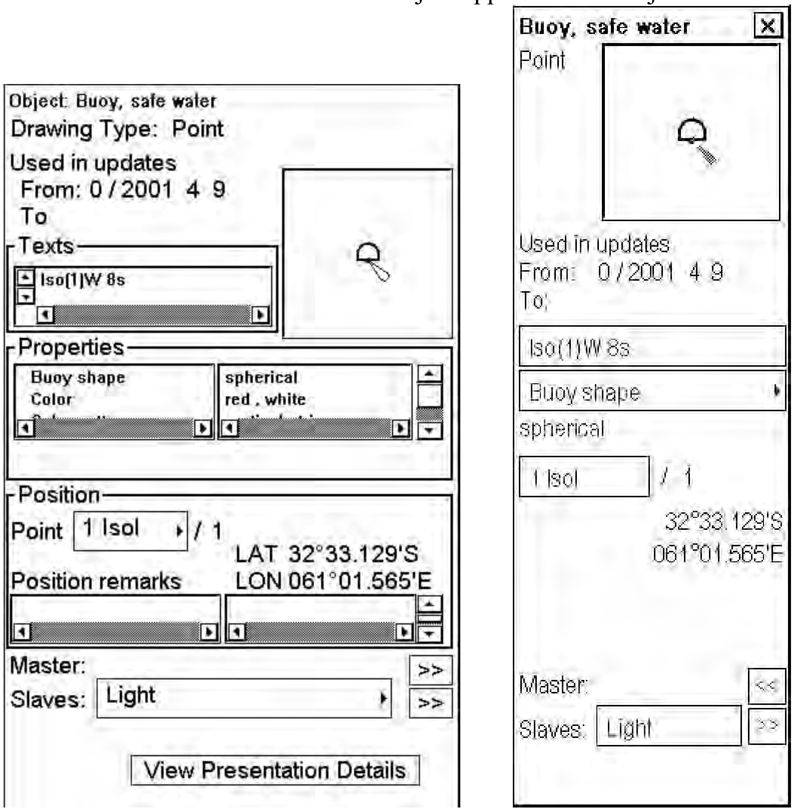



*Chart radar mode*

4. Choose desired object from the Objects in display priority order list box. Chosen object on the chart is shown with mark showing information in the Object window.



Detailed information for the chosen object appears in the Object window.

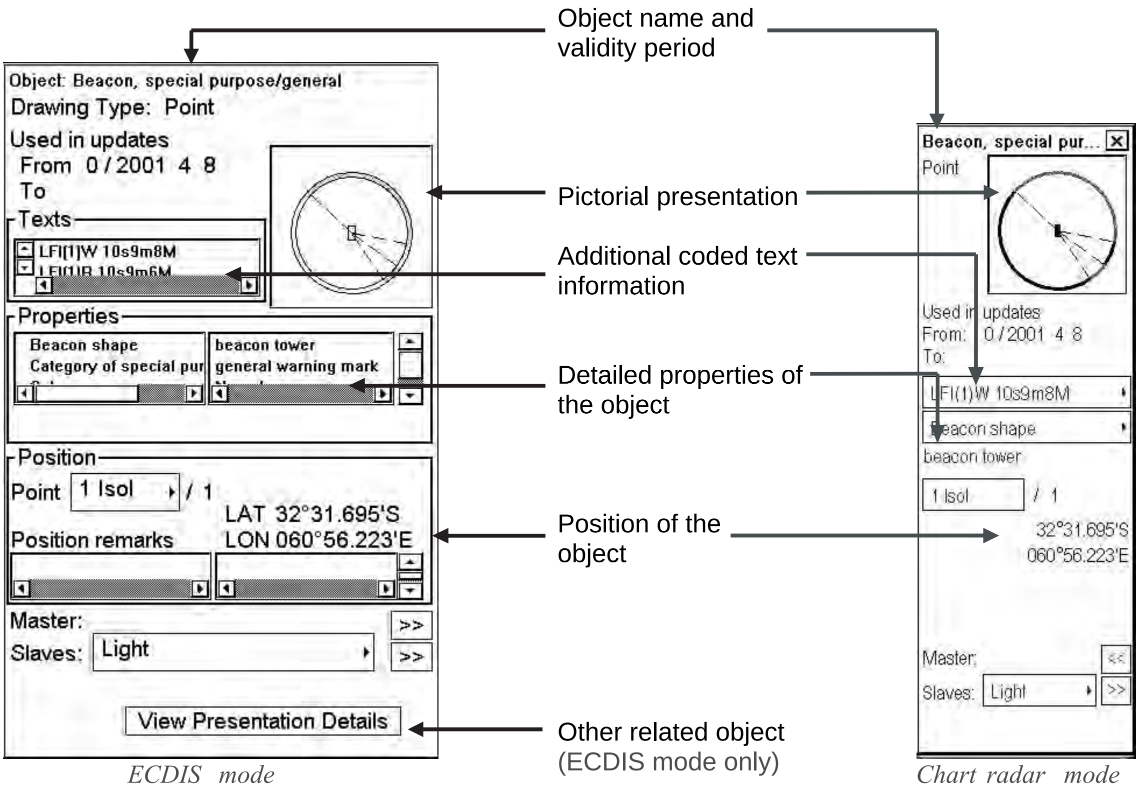



*ECDIS mode* *Chart radar mode*

5. To close the windows, click the X on the window you wish to close.

## 7.13.3 How to view properties of a vector chart object

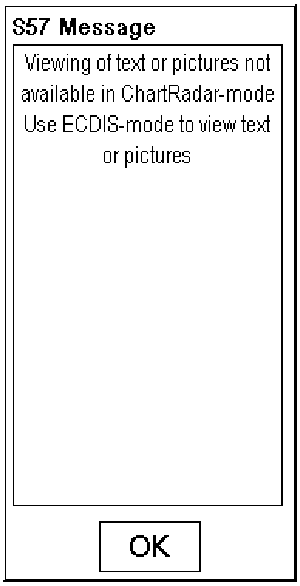
After you have chosen a vector chart object, you can view detailed information about it in the Object window:



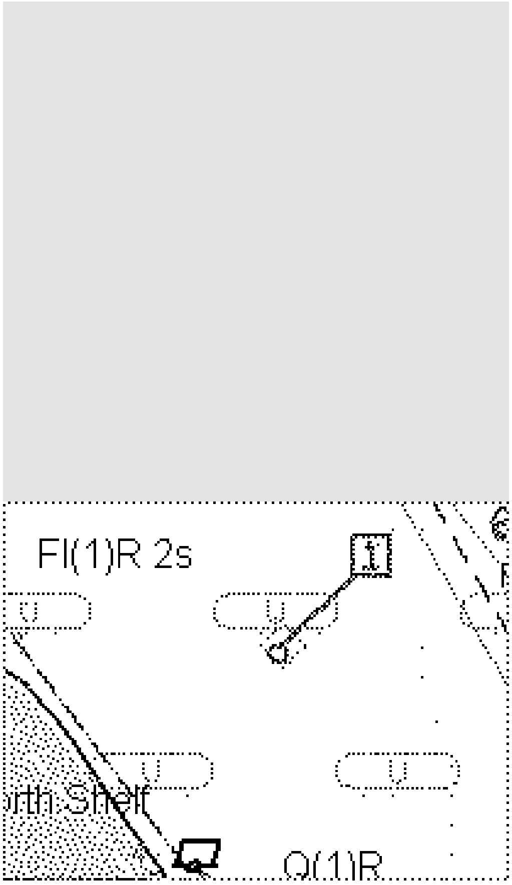

*ECDIS mode* *Chart radar mode*

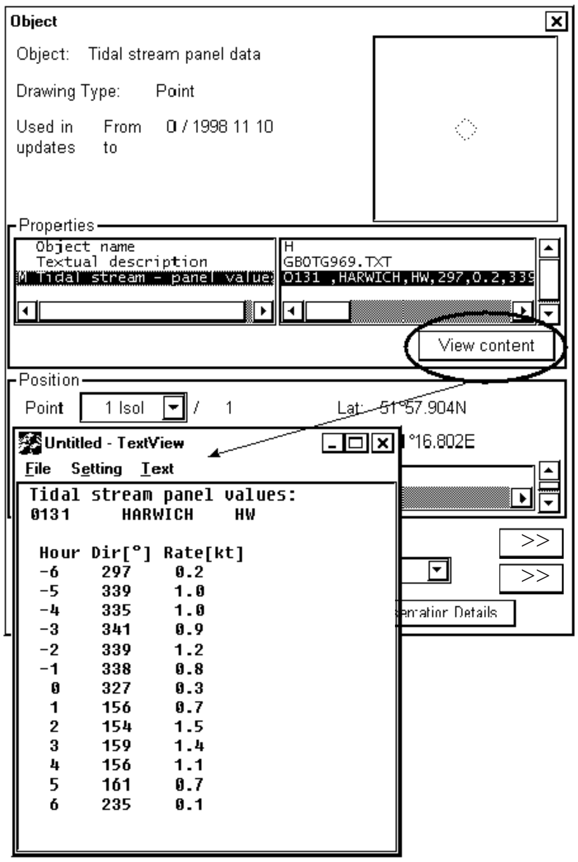
### 7.13.4 About vector chart coding

Note: If, in the chart radar mode, you click the View content button, neither text nor pictures are displayed and the following message appears.

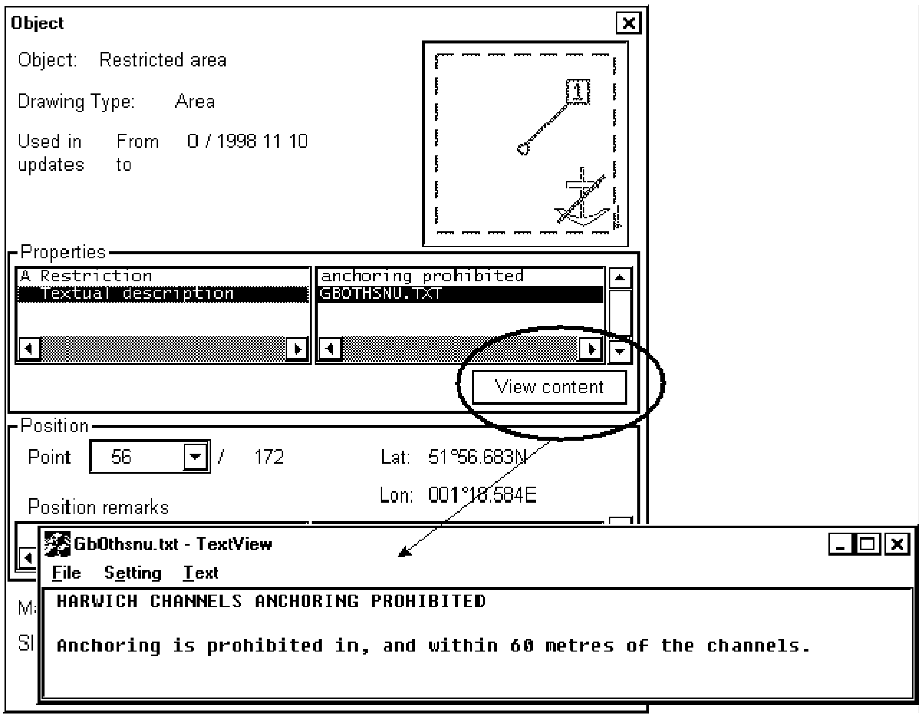



***Tidal information is available as a table***

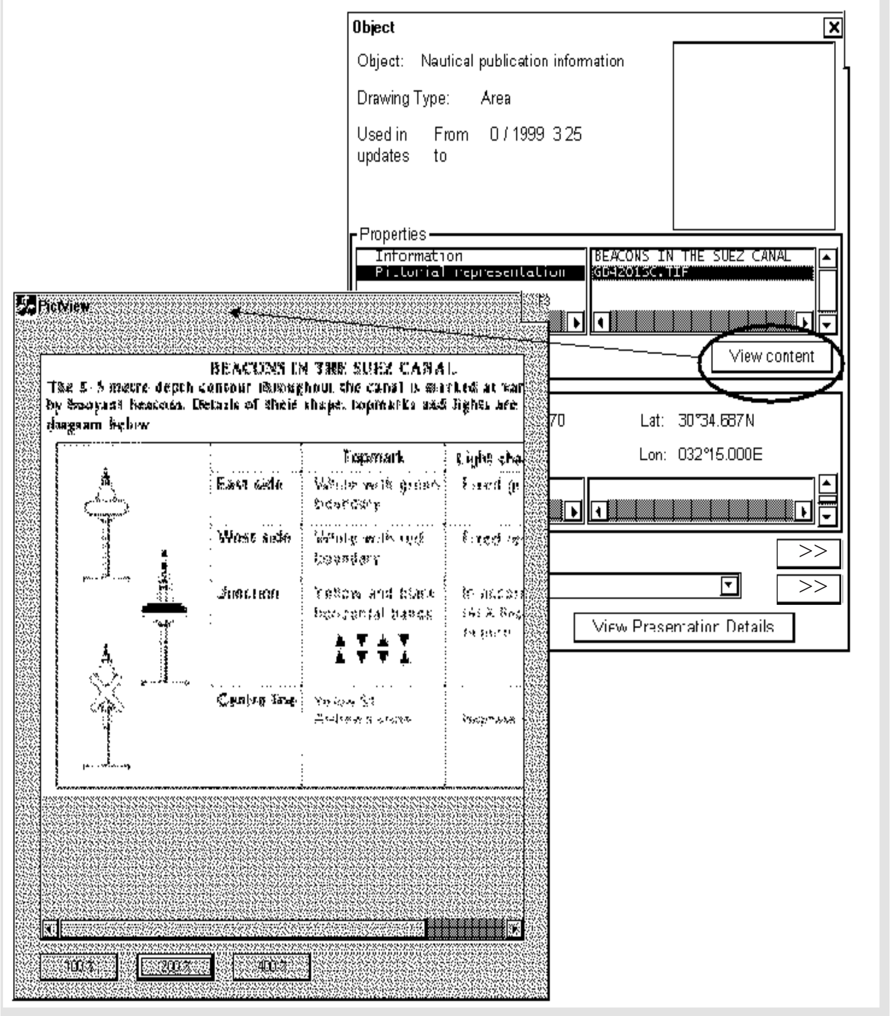


***More information is available in text***



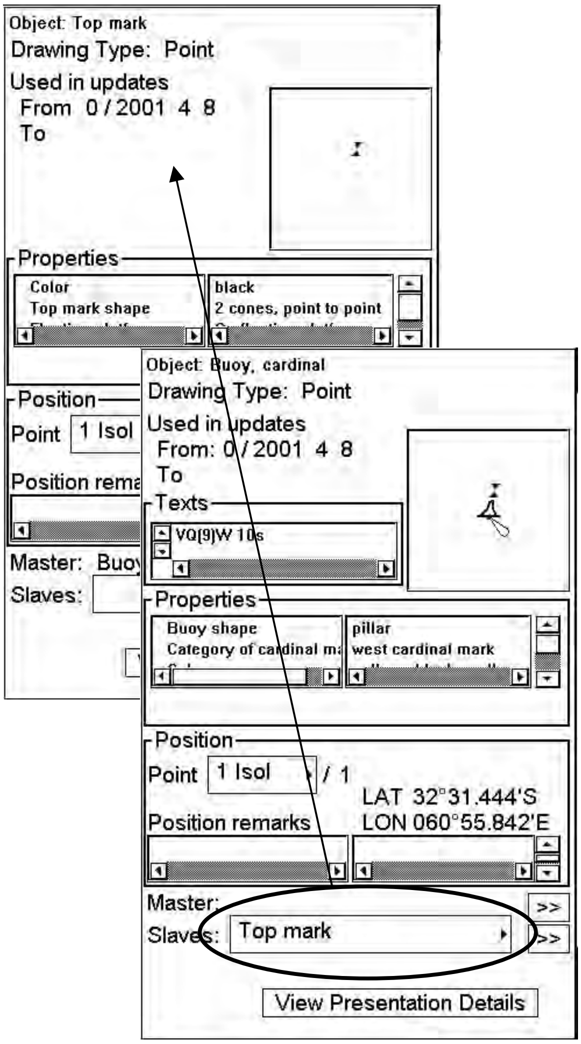

***More information is available as a picture***



### Linked objects

Often a group of chart objects are linked together. The most common example of this practice is a beacon or buoy, in which the body and the top mark are defined separately. Another example is lights and recommended track. Still another example is measurement mile. There are also other similar cases.

### Body and top hat of a beacon or buoy




ECDIS mode

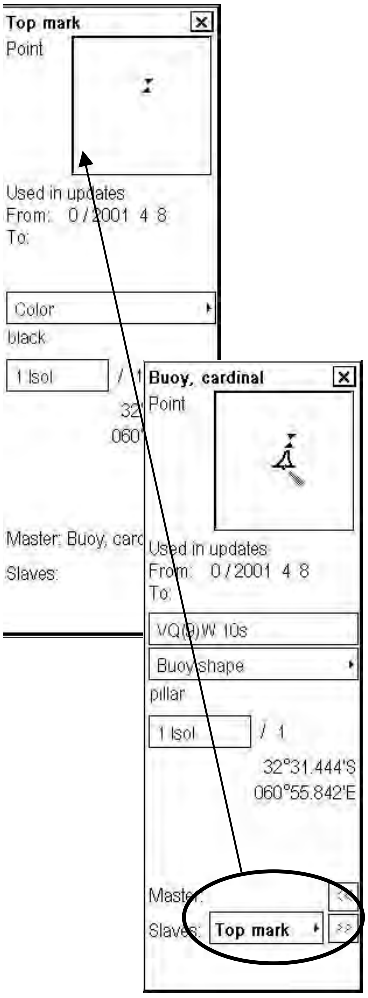
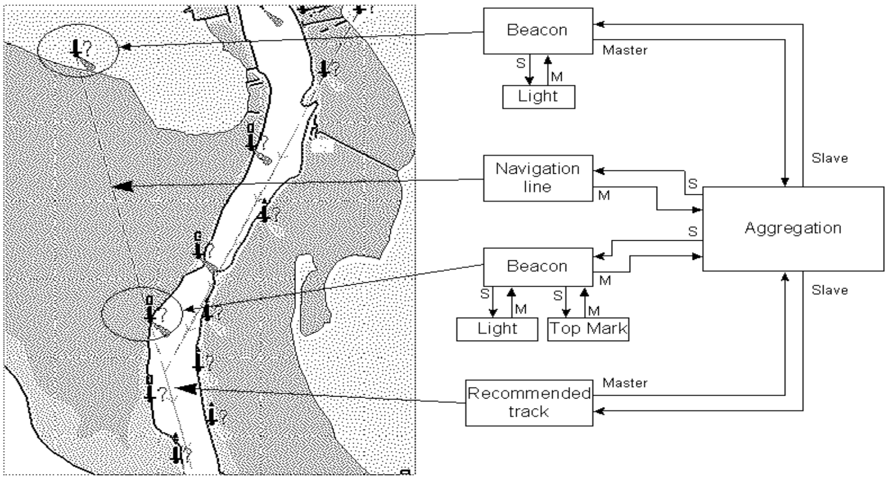
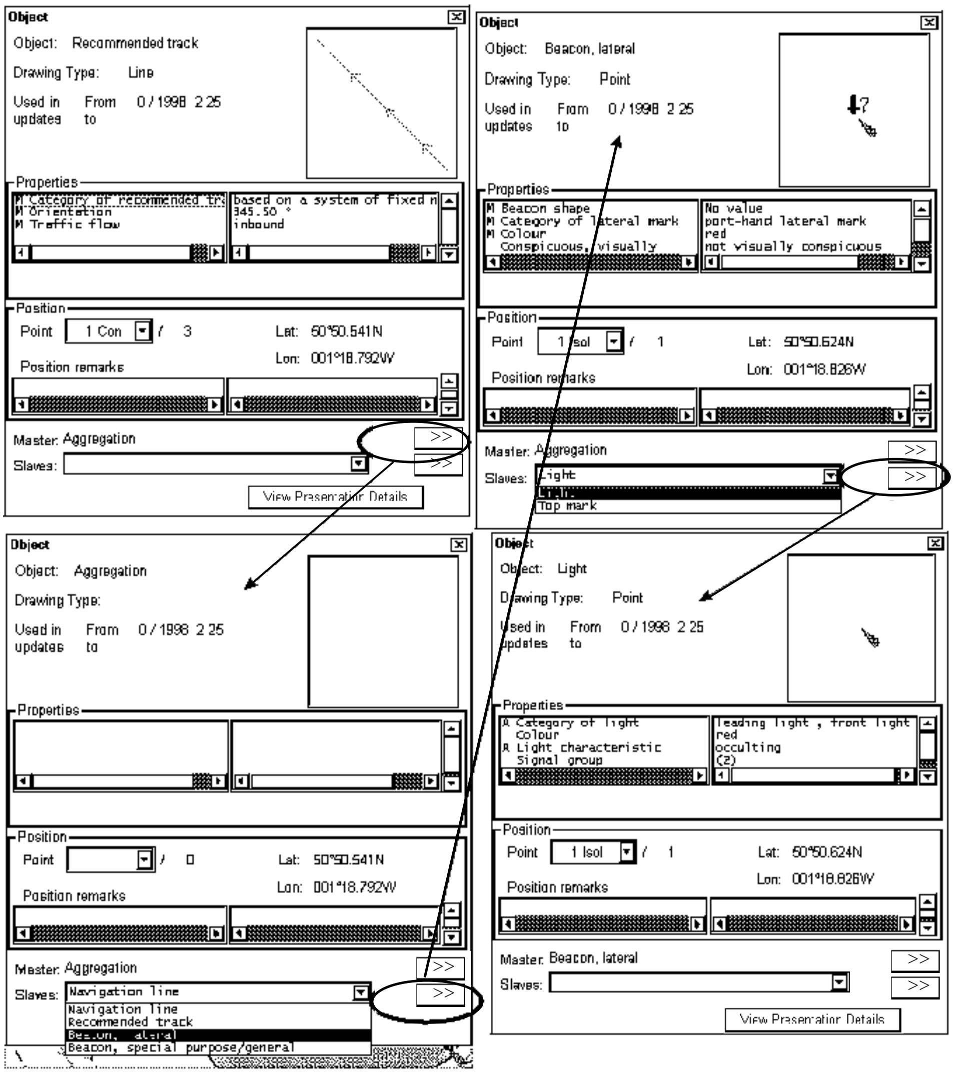


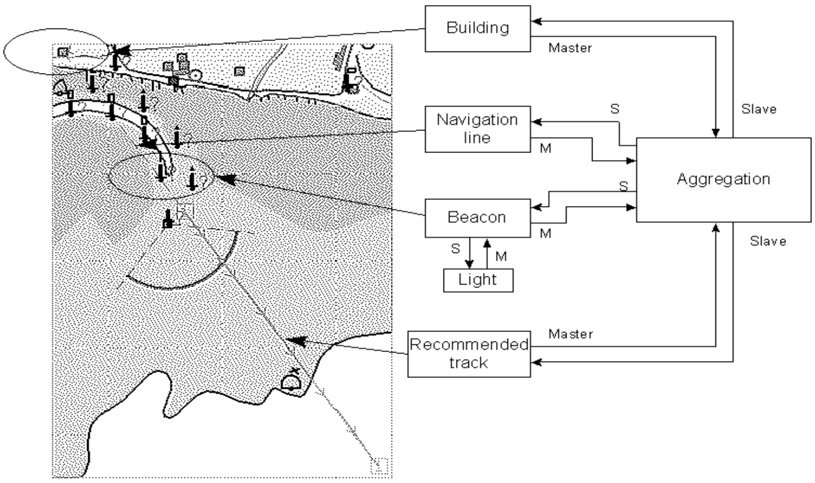

Chart radar mode

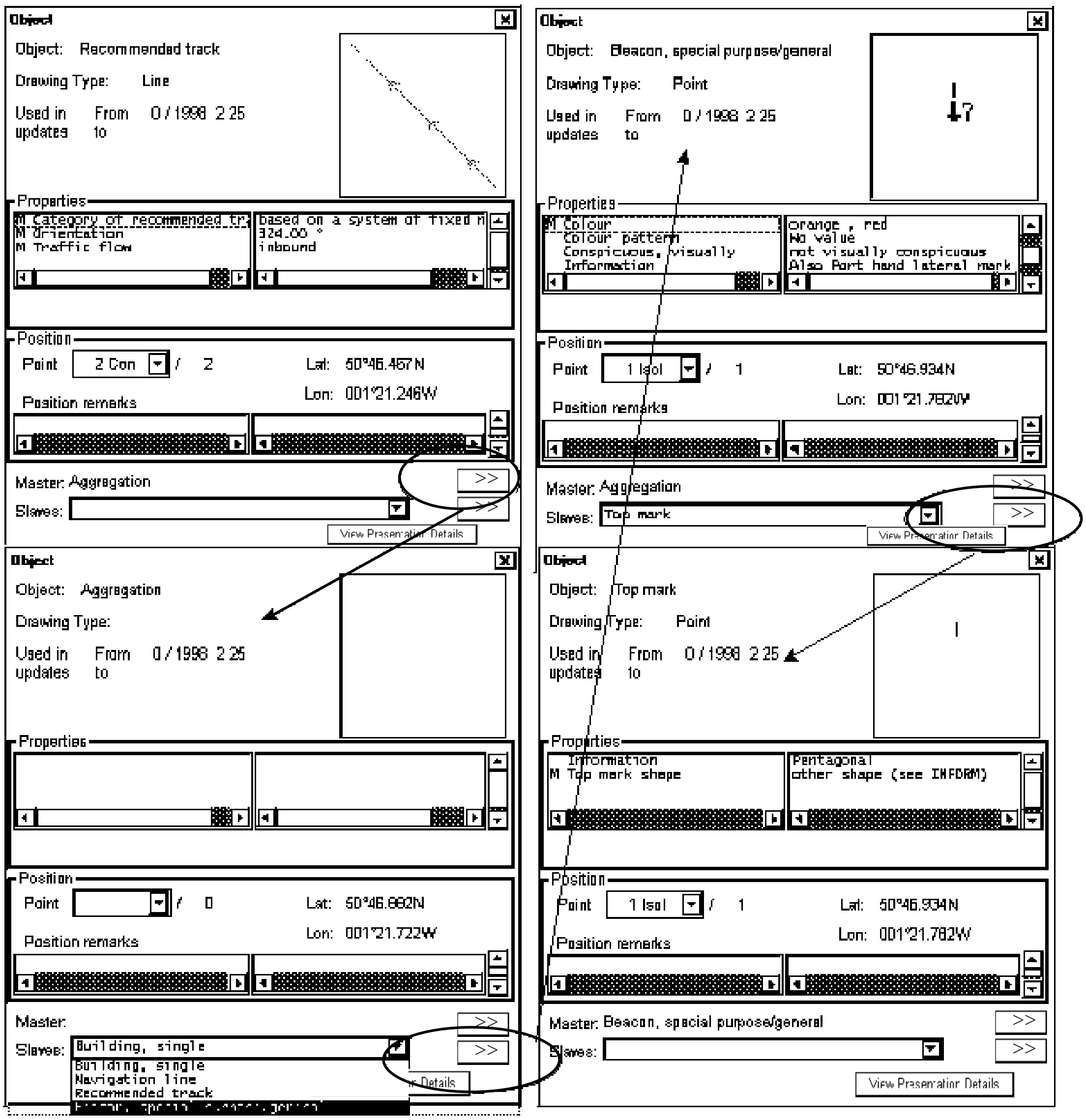
### *Recommended track defined by two beacons*



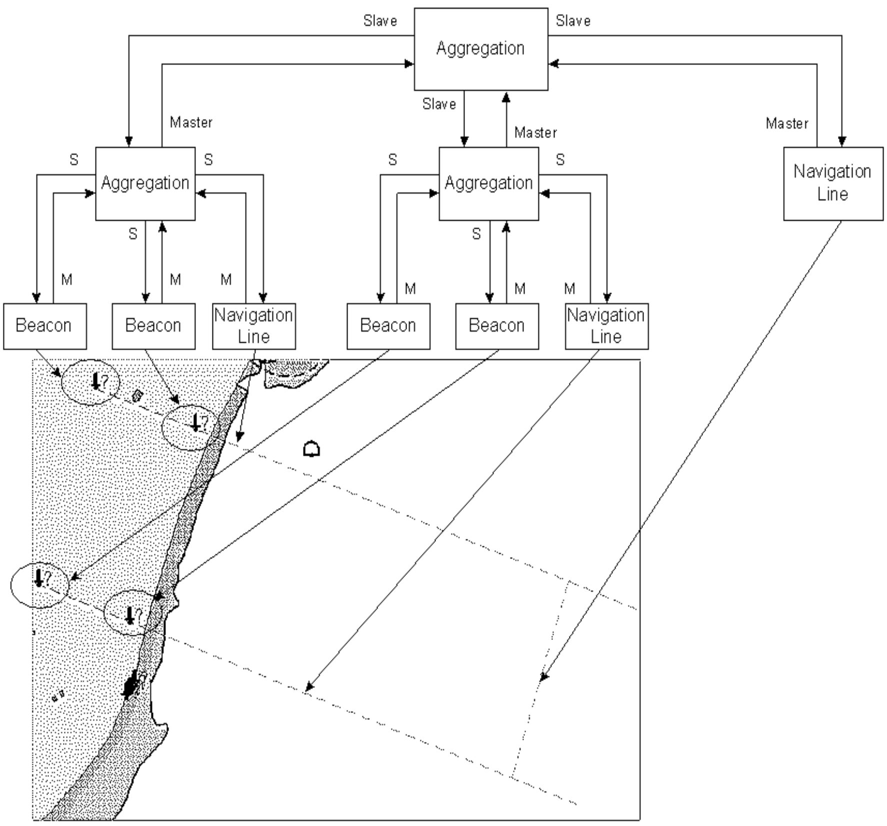



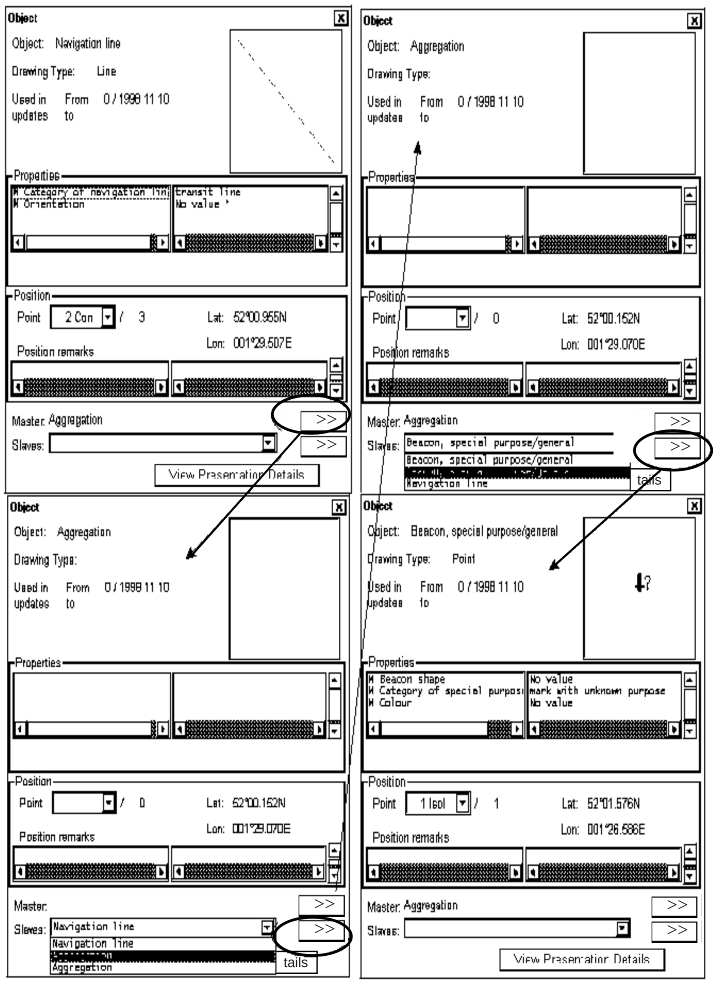
### *Recommended track defined by a building and a beacon*



## Measurement mile



# 7.14 Other Features of Vector Charts

There are some functions or features that are not used on a daily or weekly basis, but sometimes there is a need to use them.

## 7.14.1 Cell status

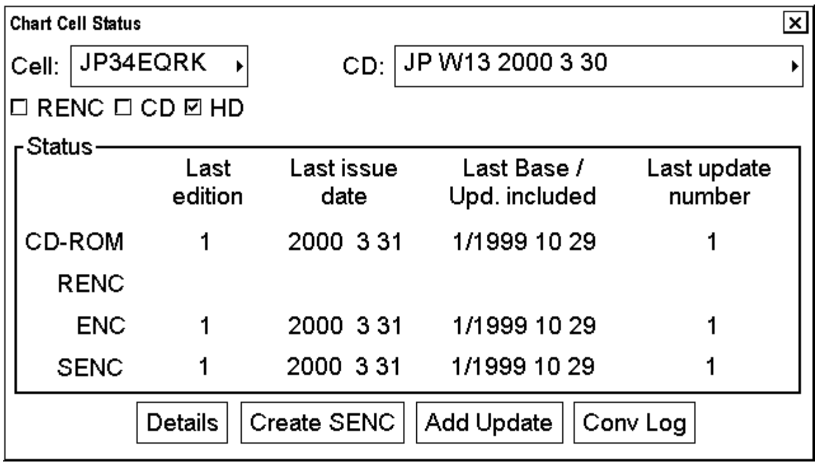
Use the Chart Cell Status function in the Chart Menu to find out the status of individual cells in your system, in a CD ROM or in an RENC.

**Status of CD ROM:** This information is based on information in the CD ROM catalogue you have loaded and chosen here from the CD ROM list box.

**Status of RENC:** This information is based on information in an RENC. One example of an RENC is PRIMAR. You get the status of cells in an RENC via telecommunications, if you have optional telecommunication installed in your system and you are a licensed user of an RENC.

**Status of ENC:** This information is based on information on the hard disk of the system. The ENC used here is S57ed3 delivery formatted chart. Before it can be displayed as a chart it has to be converted into the system's internal display format SENC.

**Status of SENC:** This information is based on information on the hard disk of the system. A SENC is the system's internal display format.



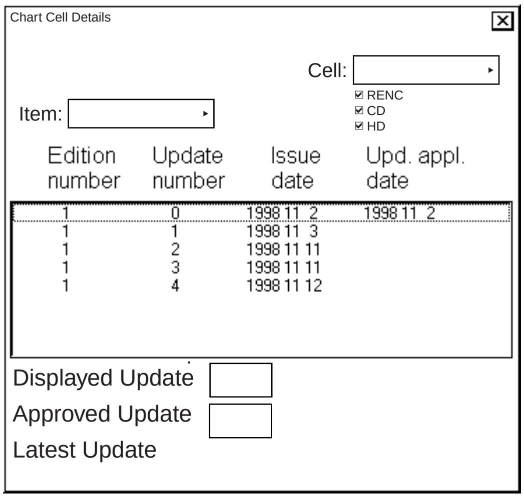

Use the **Conv Log** button to view a detailed conversion log of S57 chart cell.

## 7.14.2 S57 cell details

You can need to check when an update has been added into your chart radar. Also you can need to check what was shown in your chart display three weeks ago. There are also many other cases where you need to find what was known by your chart radar.

To view updates by their numbers, open the Chart menu, choose Chart Cell Status to display the Chart Cell Status window then click the **Details** button. You will get a Chart Cell Details window, where you can view updates by their numbers.

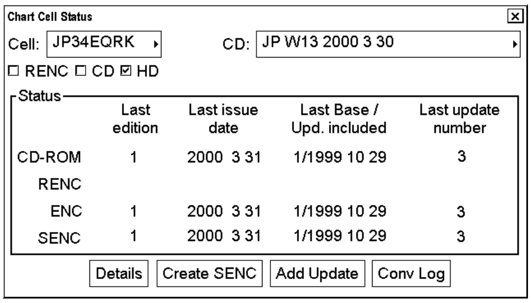
To check any situation in the past, you can use the Displayed Update and Approved Update fields to specify update number.



### 7.14.3 How to use cell status window to initiate SENC conversion

The Cell Status window in the Chart menu can be used to force a new SENC conversion for any chart cell that is already in the SENC format. Normally you do not need this feature, but it could be useful if, for example, you need to analyze why an update cannot be converted, etc.

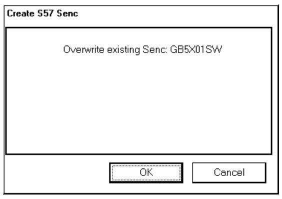
Open the Chart menu, choose Cell Status then click the **Create SENC** button to initiate SENC conversion of the base cell.

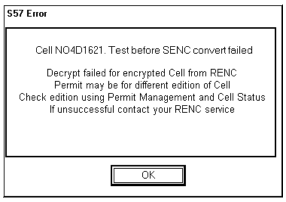



If the base cell has already been converted to the SENC format, then the system asks you if it is OK to write over existing SENC.

Click the **OK** button to overwrite the existing SENC.

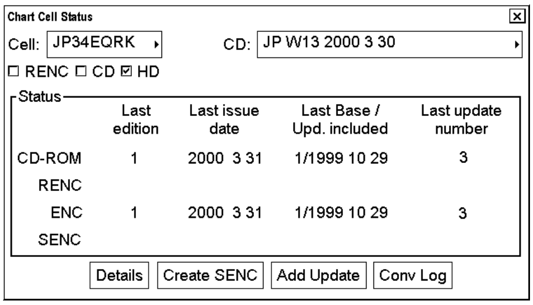
If the S57 Error window shown right appears, the permit for the chart is for another edition.




Then, the contents of the Cell Status window change as in this example at right.

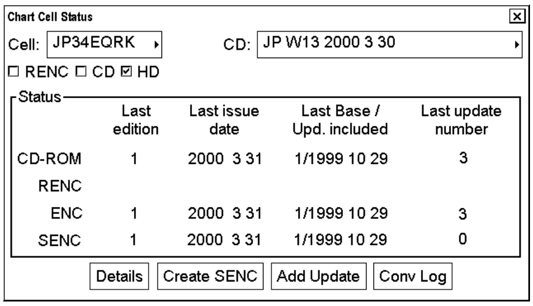
Note that the SENC row is now empty.




After the SENC conversion is completed, the contents of the Cell Status window change as in this example at right.

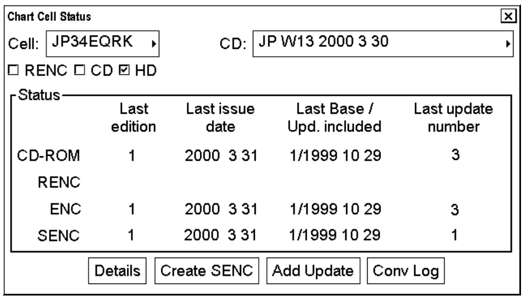
Note that the last update number for the SENC row is now 0 to indicate that only the base cell is included into the SENC.

Now click the **Add Update** button to add an update in the SENC.




After the SENC conversion for the added update is completed, the contents of the Cell Status window change as in the example at right.
Note that the last update number for the SENC row is now 1 to indicate that the first update has been added into the SENC.

Now click the **Add Update** button again to add the rest of the updates in the SENC. In this example you need to repeat it four times to get updates 2, 3, 4 and 5.



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# 8. Manual Updates

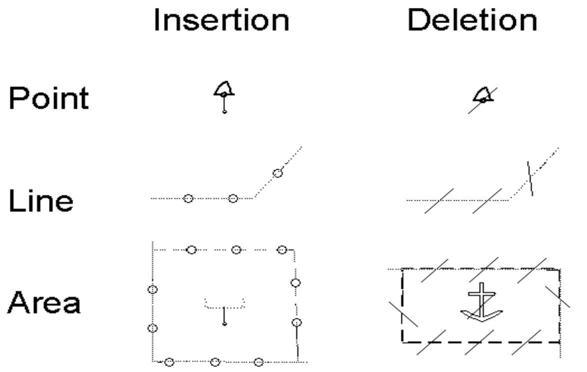
SOLAS require that mariners keep their charts up-to-date for an intended voyage. Mariners receive chart corrections and other essential information for the area of their intended voyage as

- Notices to Mariners (by post, by email, by fax, etc.)
- Navtex warnings

Mariners should also keep the electronic charts in their chart radar up-to-date. Regardless of the chart material used, mariner must know which of these chart corrections are applied into their chart radar charts and which of them needs to be added as manual updates.

Manual update may include deleting an already existing object, modifying a position or other characteristics of an already existing object or inserting of a new object. In this chart radar, manual updates are stored in a common database.

Mariners cannot permanently remove any of the official objects from the chart display. If a mariner needs to make obsolete any of the official objects he deletes them. Then, in practice, the deleted features are still visible, but they are displayed a certain way to indicate a deleted object.




However, a mariner can remove objects that he has inserted himself.

Note that the manual updates have no automatic connection to any automatic update received later for S57 charts. If a manual update itself became obsolete, because the official chart has been updated to include the update defined as a manual update, the mariner must himself delete the obsolete manual update in question.

This chart radar records complete usage of manual updates. All deletions, modifications and insertions are recorded and time stamped. If the mariner wishes to see what kind of manual updates he had in the past, for example, two weeks ago, he uses Update History to specify the relevant date range. For information on how to set Display and Approve dates, see section 7.11 Chart Viewing Dates and Seasonal Features of the Vector Chart.

## 8.1 Symbols to Use with Manual Updates

Manual updates can be used for the following purposes:

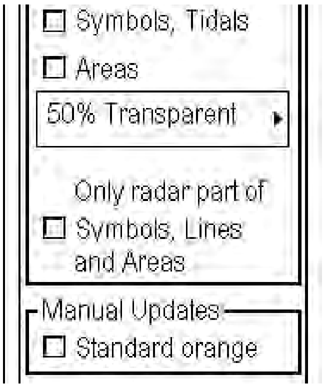
- Keep charts up-to-date using similar symbols as the real chart uses. We refer to these symbols as "True symbols".
- Keep charts up-to-date using conspicuous orange symbols reserved for this purpose. We refer to these symbols as "Orange symbols".
- Add additional mariner information using conspicuous orange symbols reserved for this purpose.

Orange symbols are recommended because then you, your mates and pilots can easily find these symbols. Another benefit of the orange symbols is that they are very easy to insert. However, orange symbols do not cover all possibilities. Experienced users can use true symbols to create their own cartography.

# 8.2 How to Display Manual Updates

## 8.2.1 How to control visibility of orange symbols from manual updates

Visibility of the orange symbols from manual updates is controlled on the Mariner page of the Symbol Display dialog box.




On the Mariner page the item Manual Updates is selected to "Std Orange".

For chart alerts calculation, the following orange symbols can be detected and highlighted during route planning and route monitoring. The associated alert is "860 Safety contour".

Drawing type:

- Point: Mariner Danger Highlight
- Point: Mariner Foul Ground
- Point: Mariner Isolated Danger
- Point: Mariner Obstruction
- Point: Mariner Under Water Rock
- Point: Mariner Wreck
- Line: Mariner Danger Highlight Line
- Area: Mariner Danger Highlight Area

## 8.2.2 How to control visibility of true symbols from manual updates

Chart features added by manual updates behave exactly as any other chart feature. Their visibility follows common rules. For more information, see section 7.9.3 How to control visible chart features (chart display).

# 8.3 How to Control Chart Viewing Dates of Manual Updates

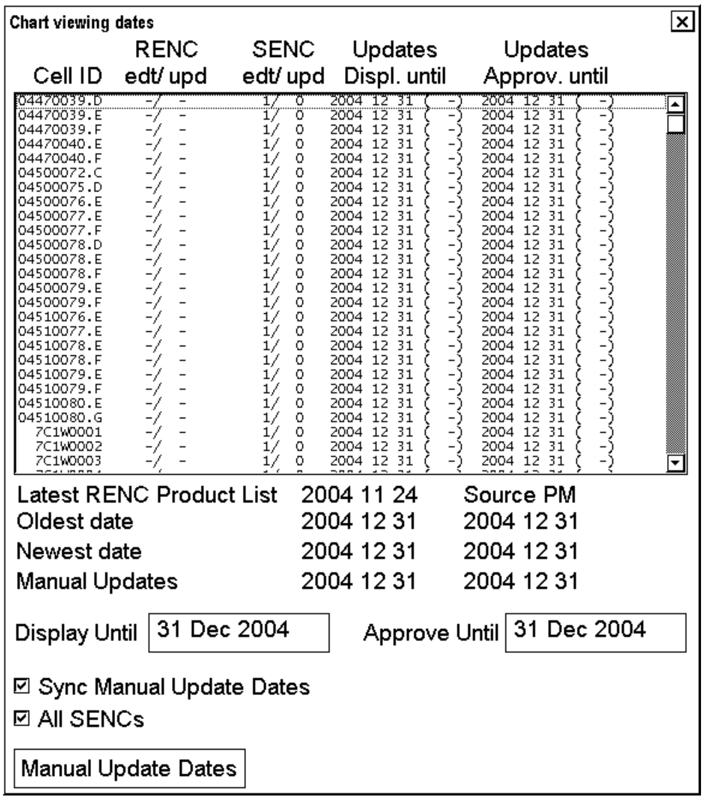
## 8.3.1 How to set current date for viewing

Manual updates operate like any other S57 chart that contains updates and other set chart viewing dates features.

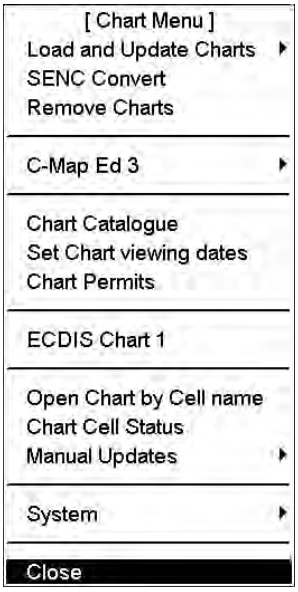
When you accept manual updates as permanent, the system sets Display Until of manual updates as current date of the system. To set Approve Until as current date of the system, you must open the Set chart viewing dates window (in the Chart menu) and perform Approve Until. For how to set current date, see section 7.11 Chart Viewing Dates and Seasonal Features of the Vector Chart. Recommended settings in the Chart viewing dates window are:

- Sync Manual Update Dates
- All SENCs

See the example below where Display until and Approve until are set as the system current date.

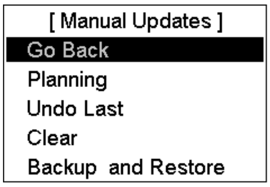


## 8.4 How to Use Manual Update Editor w/Orange Symbols




The manual update editor has the choices shown below and you can choose one by choosing Manual Updates from the Chart menu.

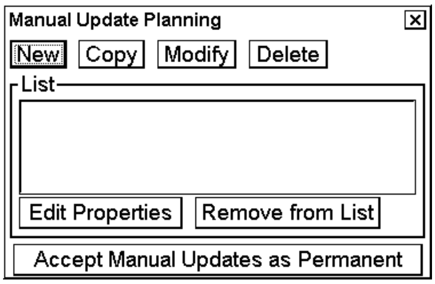
- **Planning:** Operate with new manual updates.
- **Undo Last:** Remove last accepted manual update planning session. By repeating Undo Last you can remove any amount of old manual update planning sessions.
- **Clear:** Remove all manual updates in a single operation.
- **Backup and Restore:** Make a backup or recall already recorded backup.




### 8.4.1 Manual update planning

The manual update editor operates in sessions. You create a session when you activate the Manual Update Planning dialog box, displayed by choosing Manual Update from the Chart menu followed by Planning from the sub menu. You can freely delete, modify, copy or create chart objects until you feel finished with your session. Then, you terminate your session by clicking the **Accept Manual Updates as Permanent** button then the chart radar stores your manual updates permanently. If you need to leave your manual update session and discard all modifications made during the current session, click X in upper right corner.

**Note:** The manual update editor is only available in the North Up or Course Up orientation mode.




**New**, **Copy**, **Modify**, **Delete:** These buttons are used to collect chart objects into a list shown in the Manual Update Planning dialog box for further editing during current session of manual update planning. **New** creates an object from scratch. **Copy** creates an object using an existing object as an example. **Modify** changes an existing object. **Delete** removes an existing object.

**Remove from List:** If you made a manual update by mistake, you can remove it if you haven't accepted it yet as permanent. You can remove it by choosing (highlighting) that chart object in the List then clicking the **Remove from List** button.

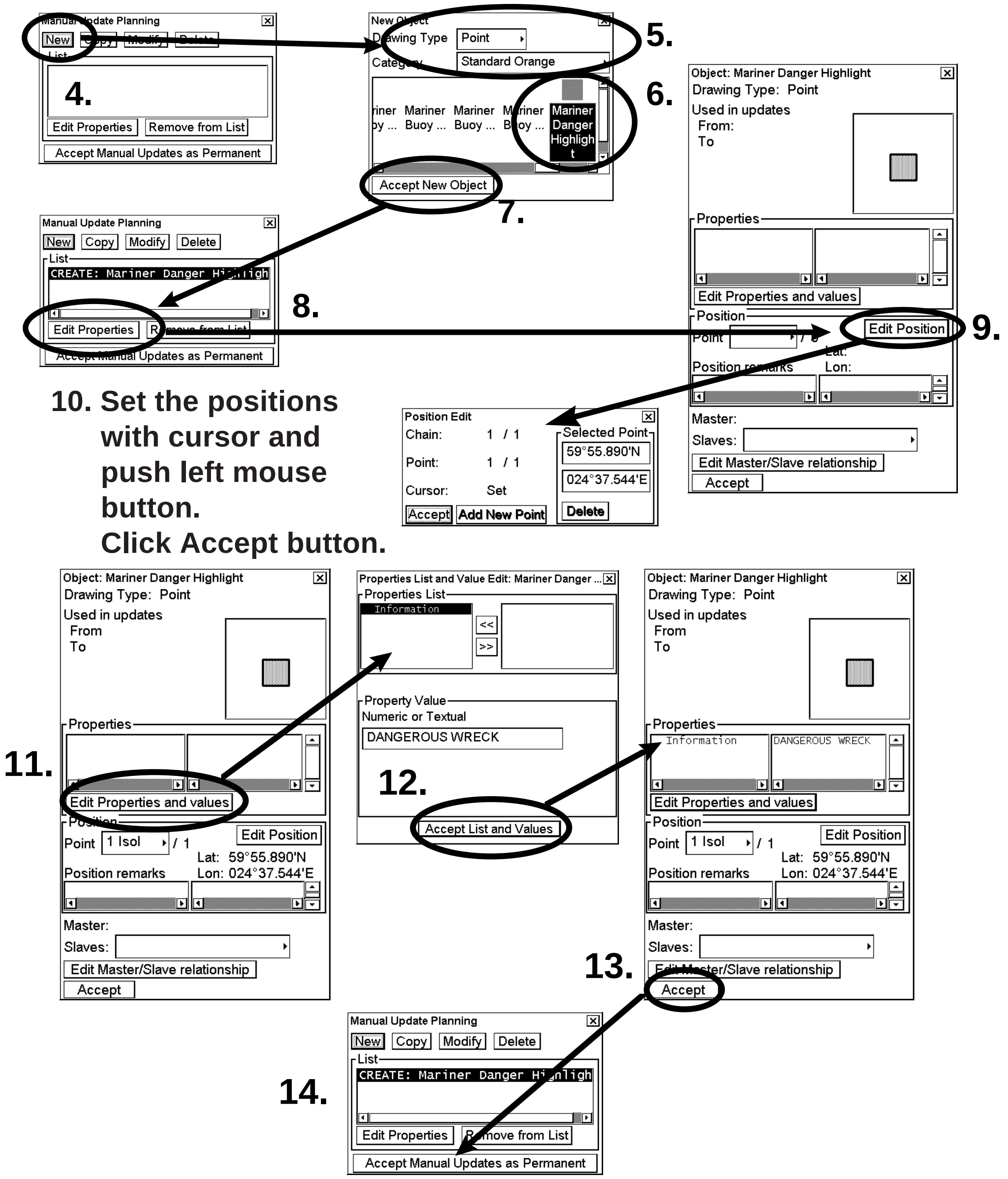
**Edit Properties:** You can edit properties of a chosen (highlighted) chart object by using the **Edit Properties** button.

### 8.4.2 How to insert new orange symbols

The mariner can insert a new object either using New or Copy in the Manual Update Planning dialog box. With New he creates a new feature from scratch. With Copy he uses an already existing object as an example for the newly inserted feature.

#### *How to insert new orange symbols using "new"*

When you want to create a new object from scratch, you start creating by clicking the **New** button in the Manual Update Planning dialog box. A New Object window appears. Use the default Category Standard Orange to insert a new orange symbol. The detailed procedure is as follows:



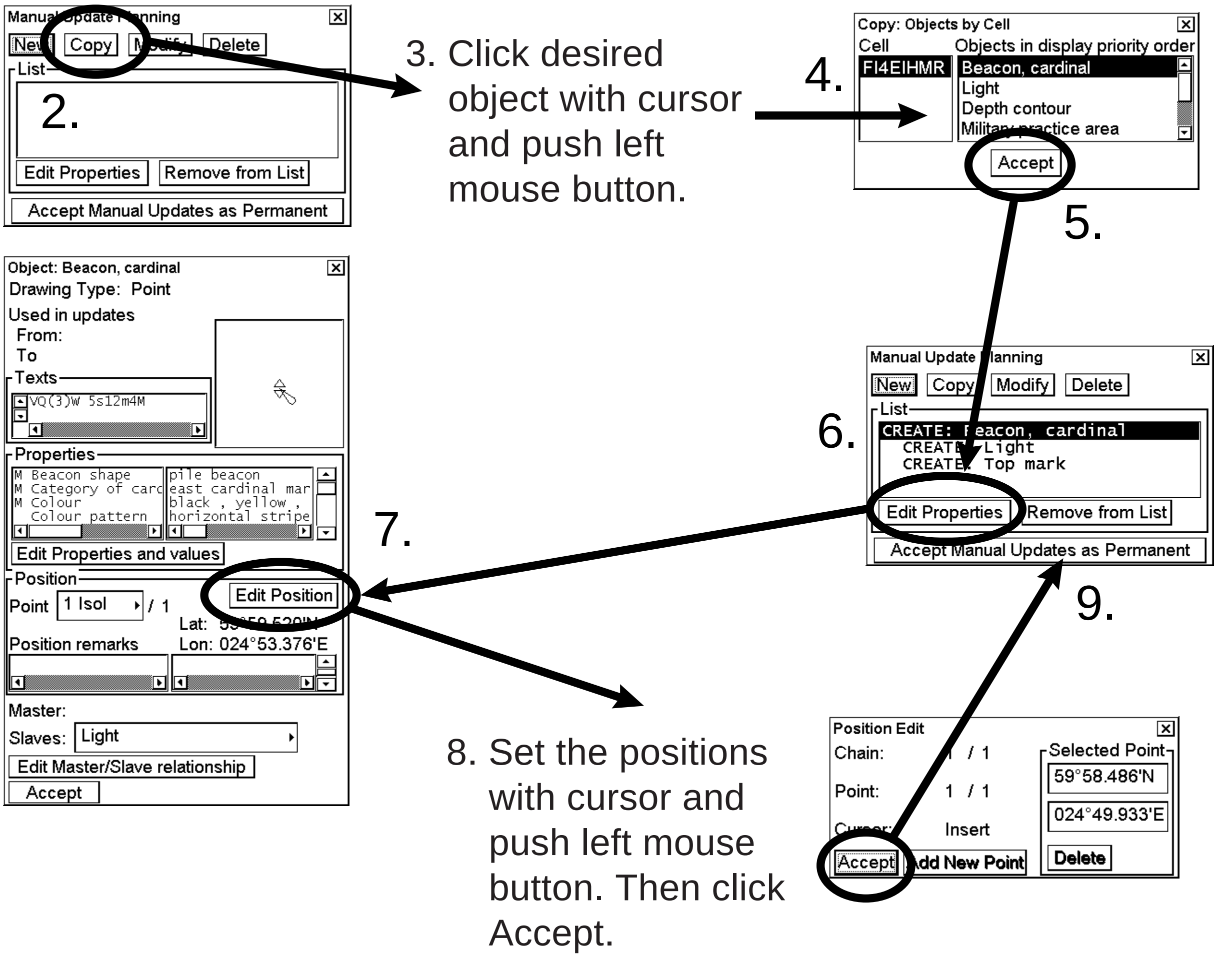
1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area.
2. Push the right button.
3. Choose Manual Updates, push the scrollwheel, choose Planning then push the scrollwheel.
4. Click the **New** button in the Manual Update Planning dialog box.
5. Choose desired Drawing Type (Point, Line or Area), and choose Category as Standard Orange.
6. Choose desired Symbol from the Symbol list box.
7. Click the **Accept New Object** button.
8. Click the **Edit Properties** button.
9. Click the **Edit Position** button.
10. Use the cursor and the left button to define position of symbol then click the **Accept** button. Now you have two alternatives: If you want to add a text, then continue from step 11. Otherwise go to step 14.
    **Note:** Select the cursor mode according to drawing type as shown below.

| Drawing type | Cursor mode |
|---|---|
| Point: | Set (Set Center) |
| Line: | Select Chain |
| | Select Point |
| | Insert Point |
| | Append Point |
| | Set Center |
| Area: | Select Chain |
| | Select Point |
| | Insert Point |
| | Append Point |
| | Set Center |

11. If you would like to include textual information related to an orange symbol, click the **Edit Properties and values** button.
12. Highlight Information in the right side box then click the << button to move it to the left hand box then highlight it. Then, you can add textual information in the Property Value field. To enter text or numeric value, click inside the box, spin the scrollwheel to choose character desired then push the scrollwheel. After entering all characters desired, click the **Accept List and Values** button.
13. Click the **Accept** button.
14. Click the **Accept Manual Updates as Permanent** button.

### *How to insert new orange symbols using "copy"*

You can make new orange symbols by copying existing orange symbols. Then you pick up an orange symbol and make a copy of it. After copying you can modify position suitable for your purposes.




1. Follow steps 1-3 on page 8-6 to display the Manual Update Planning dialog box.
2. Click the **Copy** button in the Manual Update Planning dialog box.
3. Put the cursor on the desired object and press left button.
4. Choose object from the Objects by Cell window. There can be more than one object in the area.
5. Click the **Accept** button.
6. New orange symbols are displayed in the list in the Manual Update Planning dialog box. Then click the **Edit Properties** button.
7. Click the **Edit Position** button.
8. Put the cursor on the desired location on the chart radar display. Push the left button then click the **Accept** button.

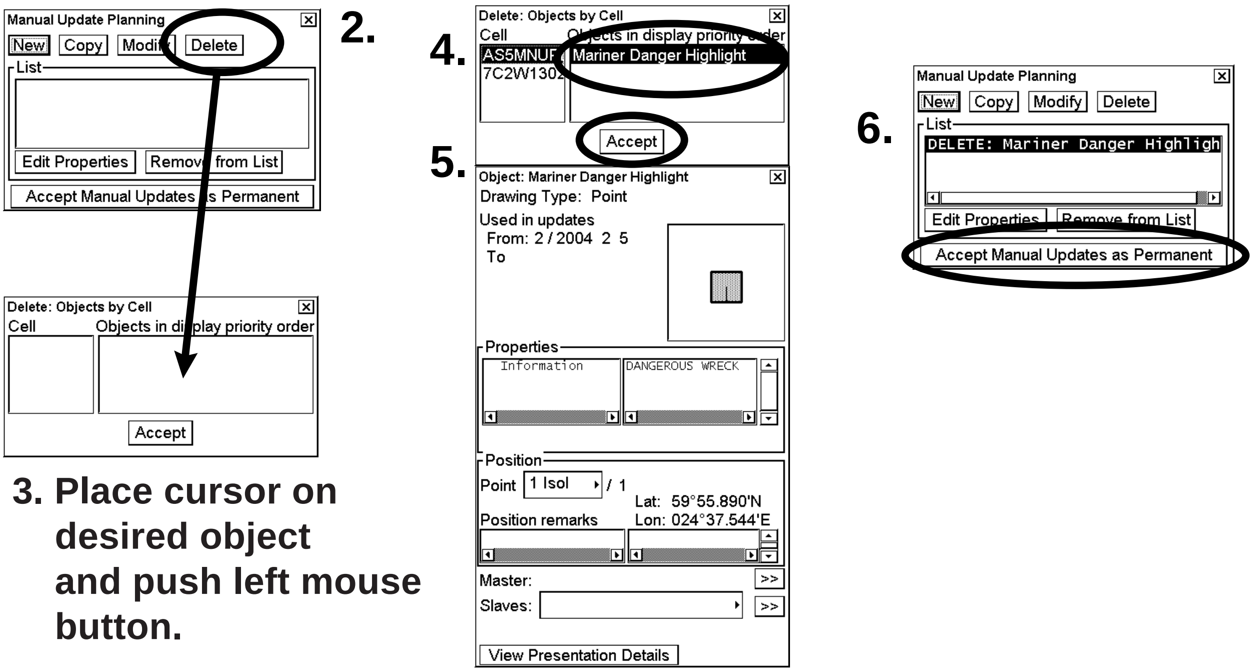
   **Note**: You must set the cursor mode correctly in to determine position. The cursor mode available depends on drawing type.

   | Drawing type: | Cursor mode |
   |---|---|
   | Point: | Set Fixed (Set Center) |
   | Line: | Select Chain, Select Point, Insert Point, Append Point, Set Center |
   | Area: | Select Chain, Select Point, Insert Point, Append Point, Set Center |

9. Click the **Accept Manual Updates as Permanent** button.

### 8.4.3 How to delete orange symbols

The mariner cannot permanently remove any of the official chart objects from the chart display. If the mariner needs to remove any of the official chart objects, he is allowed to mark them as deleted. In practice the deleted chart object is still visible, but it has a special presentation for a deleted object on top of it. To delete a chart object, do the following:



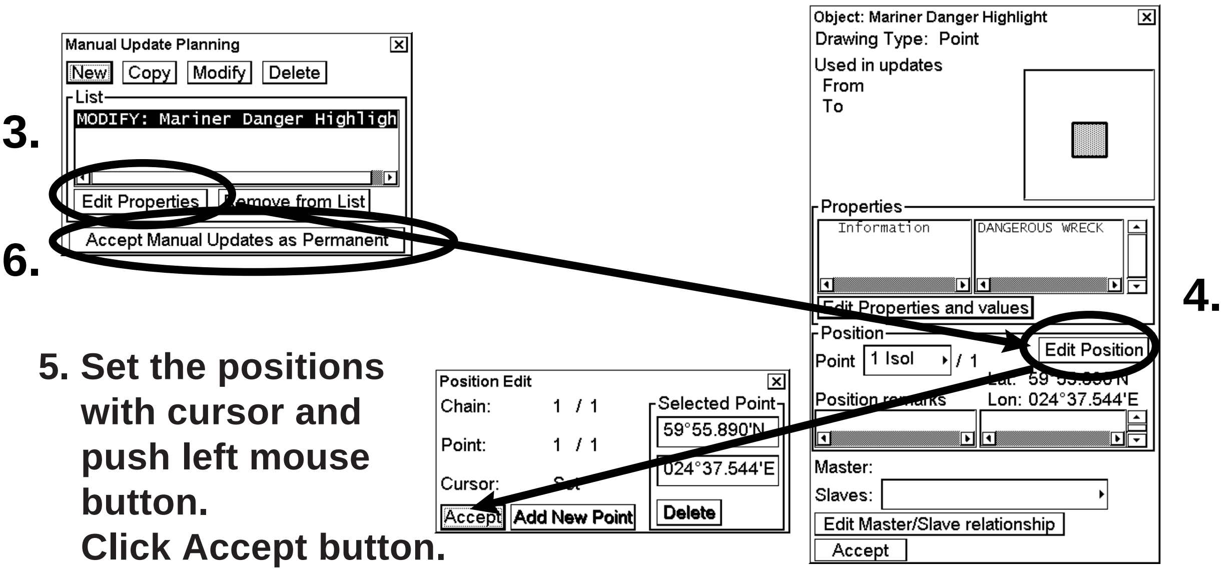

1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **Delete** button in the Manual Update Planning dialog box.
3. Put the cursor on the desired chart object then push the left button.
4. Choose the object from the Objects by Cell window that you wish to delete. You can also view data of each object before making your selection.
5. Click the **Accept** button.
6. Click the **Accept Manual Updates as Permanent** button to complete the deletion.

**Note:** If you deleted an official ENC chart object, a deletion mark is added over the original chart object that is still visible. If you delete a manual update chart object, it is removed from the chart display based on date of deletion.

### 8.4.4 How to edit position of orange symbols

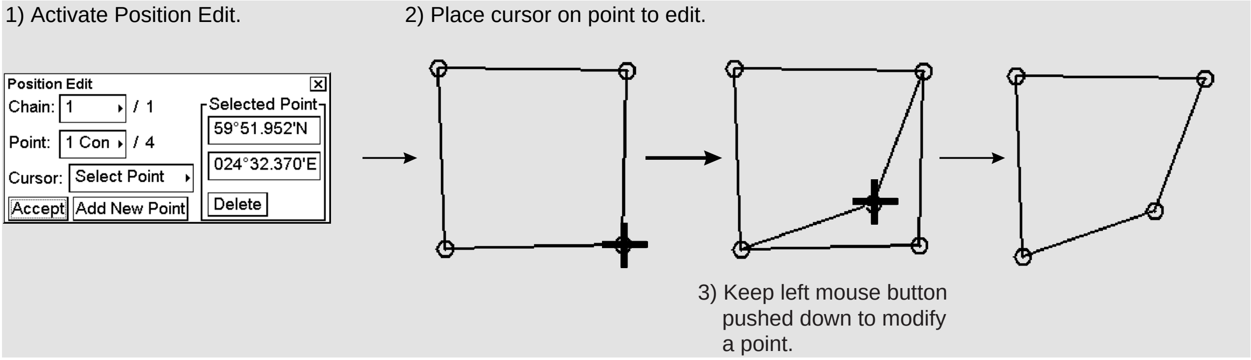
An object can be type of point, line or area.

- Point has only one point in its presentation.
- Line can consist of one or more chains. A chain consists of two or more points.
- Area consists of a line that is closed.



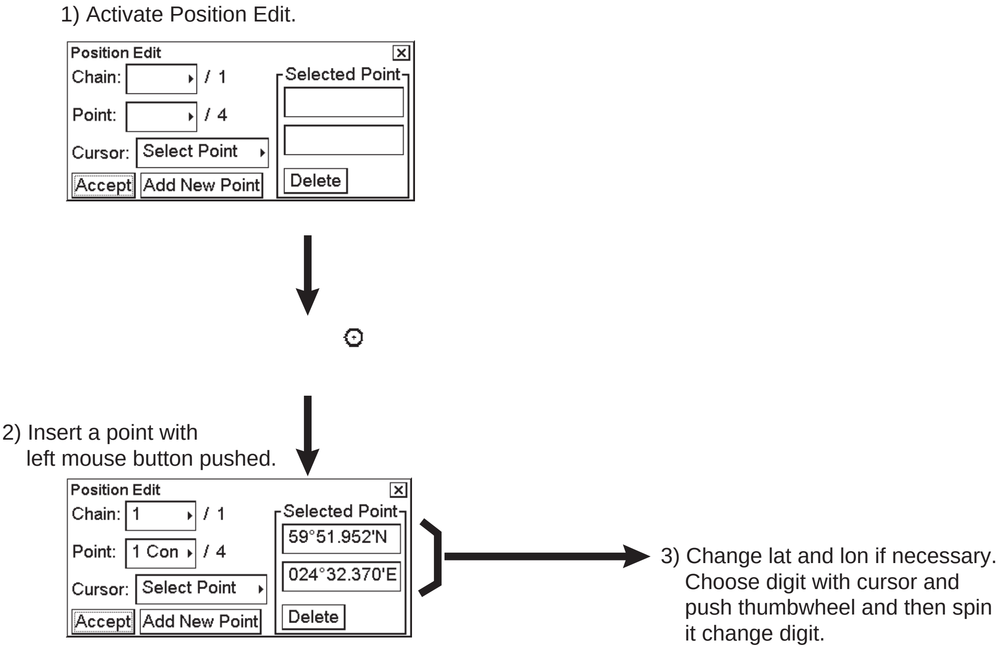

1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **Modify** button, click the object on the chart that you want to edit, then click the **Accept** button.
3. Click the **Edit Properties** button. The Object window appears.
4. Click the **Edit Position** button.
5. Edit the position of the chosen chart feature then click the **Accept** button. See the next two pages for how to modify a chart object.
6. Click the **Accept Manual Updates as Permanent** button.

**The example below shows how to modify a line.**

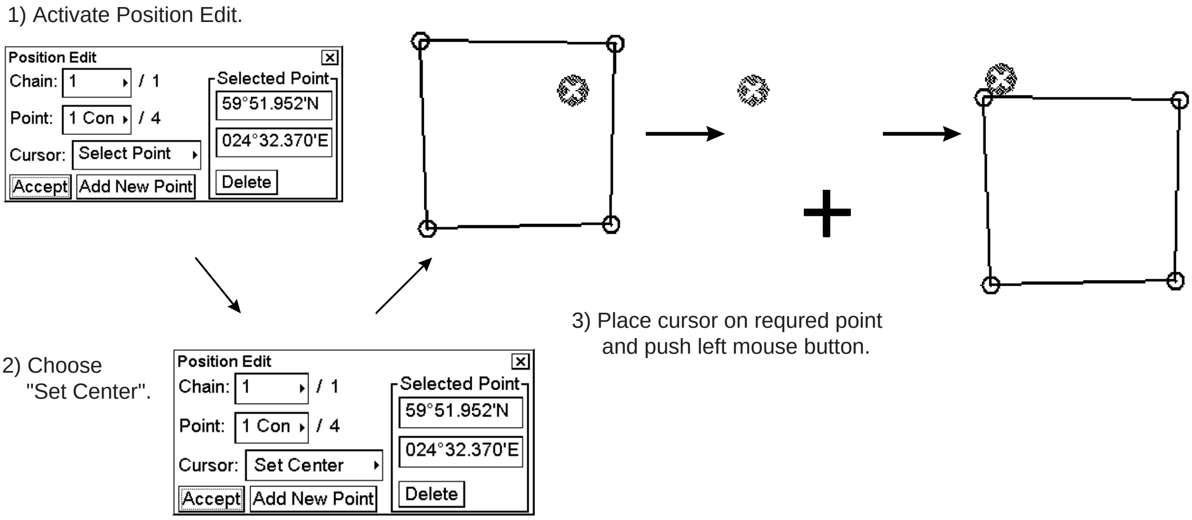


**The example below shows how to set position for a point.**

This method is also applicable to insert or append new points for existing chart features.




**The example below shows how to define an area for an existing chart feature.**



# 8.5 How to Use Manual Update Editor with True Symbols

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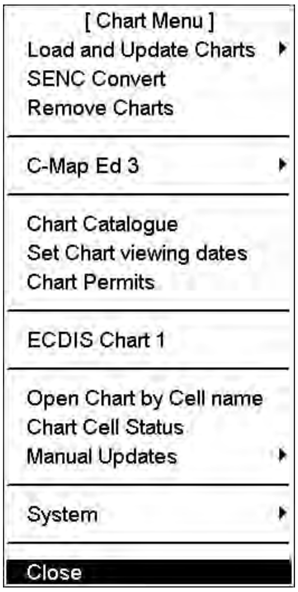
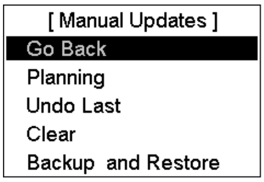



The manual update editor has the choices shown below and you can choose one by choosing Manual Updates from the Chart menu.

**Planning:** Operate with new manual updates.

**Undo Last:** Remove last accepted manual update planning session. By repeating Undo Last you can remove any amount of old manual update planning session.

**Clear:** Remove all manual updates in a single operation.

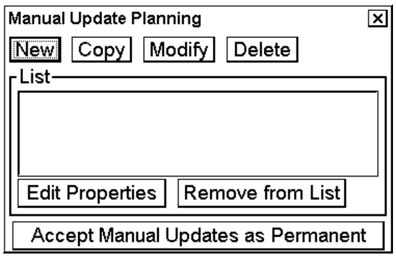
**Backup and Restore:** Make a backup or recall already recorded backup. •

With an ARCS chart, you also have "Set chart viewing dates" to set viewing date of manual updates. Note that with S57 charts "Set chart viewing dates" is in the Chart menu.

## 8.5.1 Manual update planning

The manual update editor operates in sessions. You create a session when you activate the Manual Update Planning dialog box. You can freely delete, modify, copy or create chart objects until you feel finished with your session. Then, you terminate your session by clicking the **Accept Manual Updates as Permanent** button and the chart radar stores your manual updates permanently. If you need to leave your manual update session and discard all modifications made during the current session, click X in upper right corner.

**Note:** The manual update editor is only available in the North Up or Course Up orientation mode.




**New**, **Copy**, **Modify**, **Delete:** These buttons are used to collect chart objects into a list shown in a Manual Update Planning dialog box for further editing during current session of manual update planning. **New** creates an object from scratch. **Copy** creates an object using an existing object as an example. **Modify** changes an existing object. **Delete** removes an existing object.

**Remove from List:** If you made a manual update by mistake, you can remove it if you haven't accepted it yet as permanent. You can remove it by choosing (highlighting) chart object in the List then clicking the **Remove from List** button.

**Edit Properties:** You can edit properties of chosen (highlighted) chart object by using the **Edit Properties** button.

### 8.5.2 How to insert new chart objects

The mariner can insert a new object either using New or Copy. With New he creates a new feature from scratch. With Copy he uses an already existing object as an example for the new inserted feature.

#### *How to insert new chart objects using "new"*

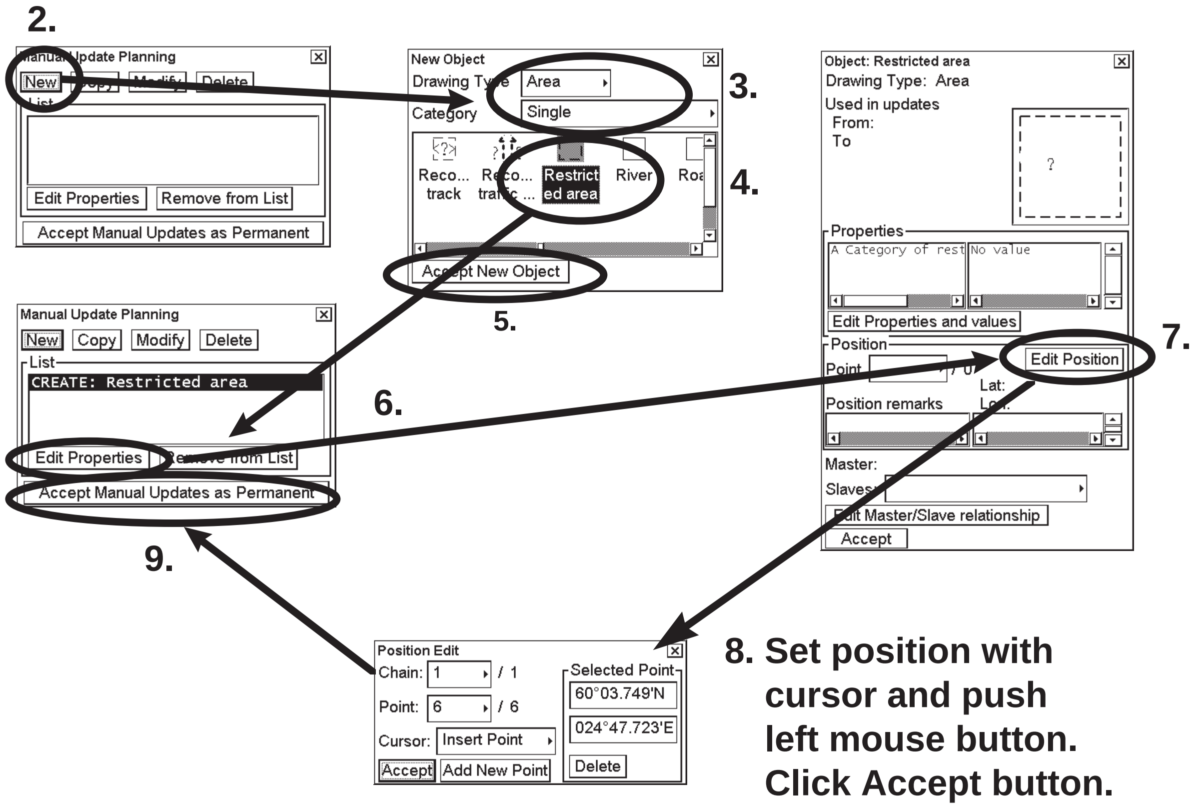
When you want to create a new object from a scratch, you start creating by clicking the **New** button in the Manual Update Planning dialog box. A S57 Object window appears. In this window you can choose geometric type of object (Point, Line or Area) and type of object:

Object type (category)

- **Standard orange**. This category is reserved for simple orange symbols.
- **Single**. All self-understandable chart objects that can be created based on a single chosen chart object. Examples are different kind of restricted and warning areas, light ships, anchorage symbols, etc.
- **Nav Aid**. Nav Aid is a guided method to create navigational aids such as lights and buoys, because they consist of several objects put together with master and slave relationships.
- **Easy Lateral Sea Mark**. Guided method to create nav aid easily for any lateral sea marks.
- **Easy Cardinal Sea Mark**. Guided method to create nav aid easily for any cardinal sea marks.
- **Easy Other Sea Mark**. Guided method to create nav aid easily for any other sea marks.
- **Easy Obstruction**. Guided method to create obstructions.
- **Easy Light**. Guided method to create nav aid easily for any simple lights.

**Example of how to insert a "restricted area"**

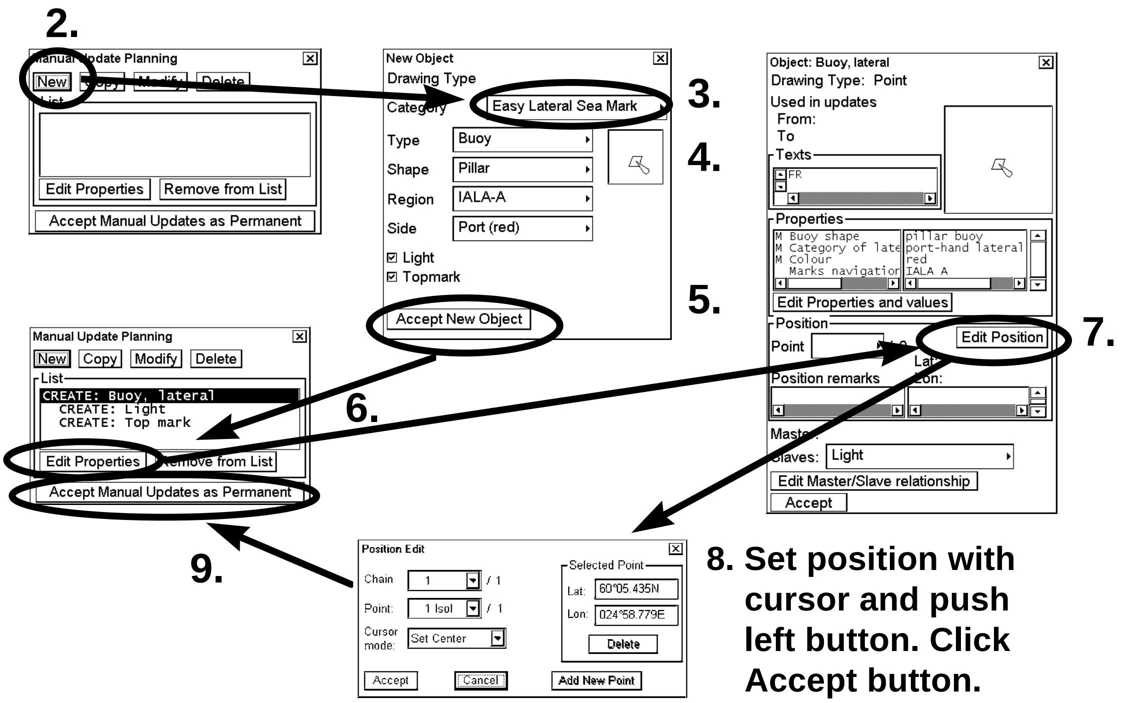
1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **New** button in the Manual Update Planning dialog box.
3. Choose Area from the Drawing Type list box then choose Single from the Category list box.
4. Choose desired icon from the list of available chart objects.
5. Click the **Accept New Object** button. New object is displayed in the List.
6. Then, click the **Edit Properties** button.
7. Click the **Edit Position** button.
8. Select "Insert Point" in the Cursor box. Set cursor on the desired location on the chart radar display then push the left button. Repeat this until you have defined all points then click the **Accept** button twice.
9. Click the **Accept Manual Updates as Permanent** button to finish.



## Example of how to insert easy lateral sea mark

The method is similar also for easy cardinal sea marks, easy other sea marks, Easy lights and easy obstructions.

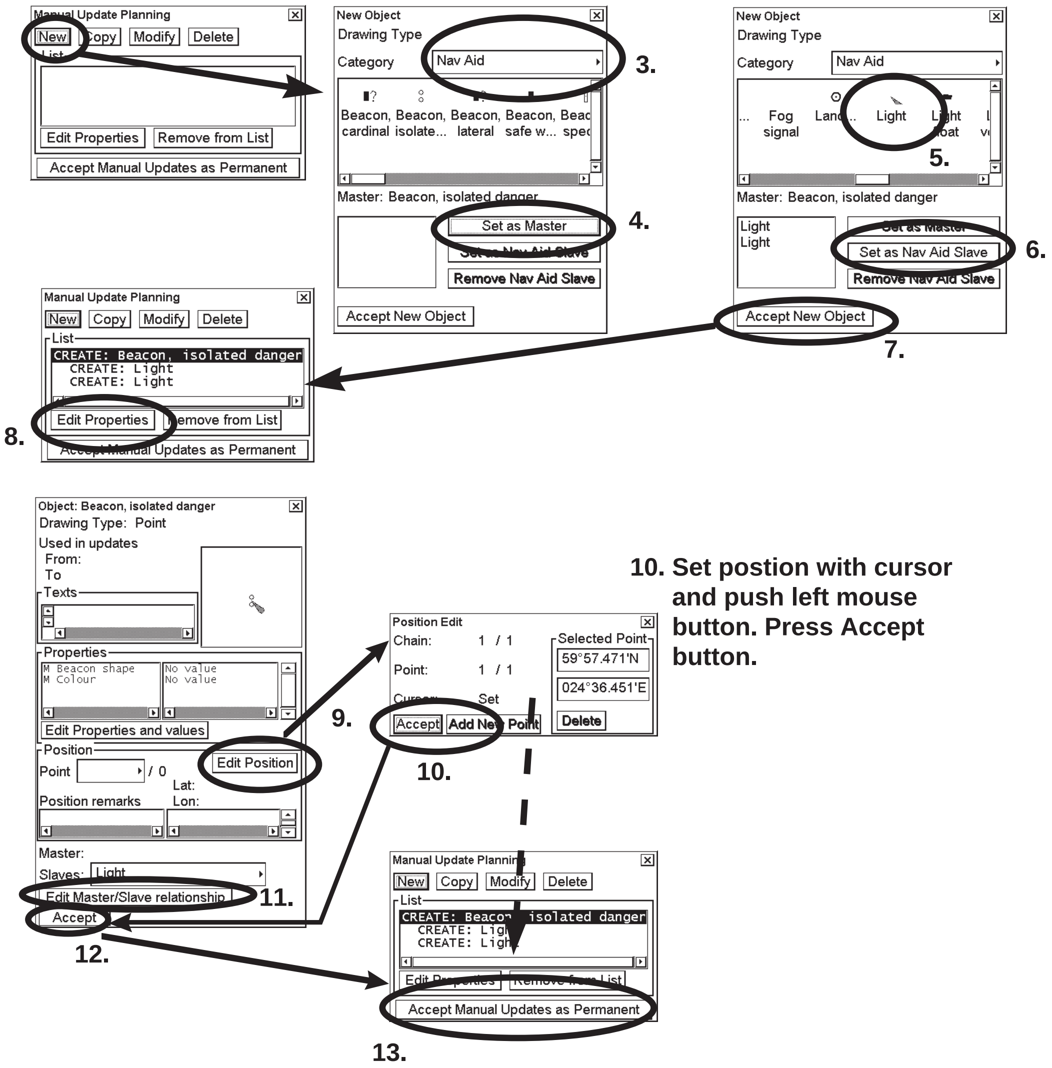
1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **New** button.
3. Choose Easy Lateral Sea Mark from the Category list box.
4. Select appropriate items from Type, Shape, Region and Side.
5. Click the **Accept New Object** button. New object is displayed in the List.
6. Then click the **Edit Properties** button.
7. Click the **Edit Position** button.
8. On the desired location on the chart radar display push left button. Click the **Accept** button twice.
9. Click the **Accept Manual Updates as Permanent** button.



## Example of how to insert a nav aid

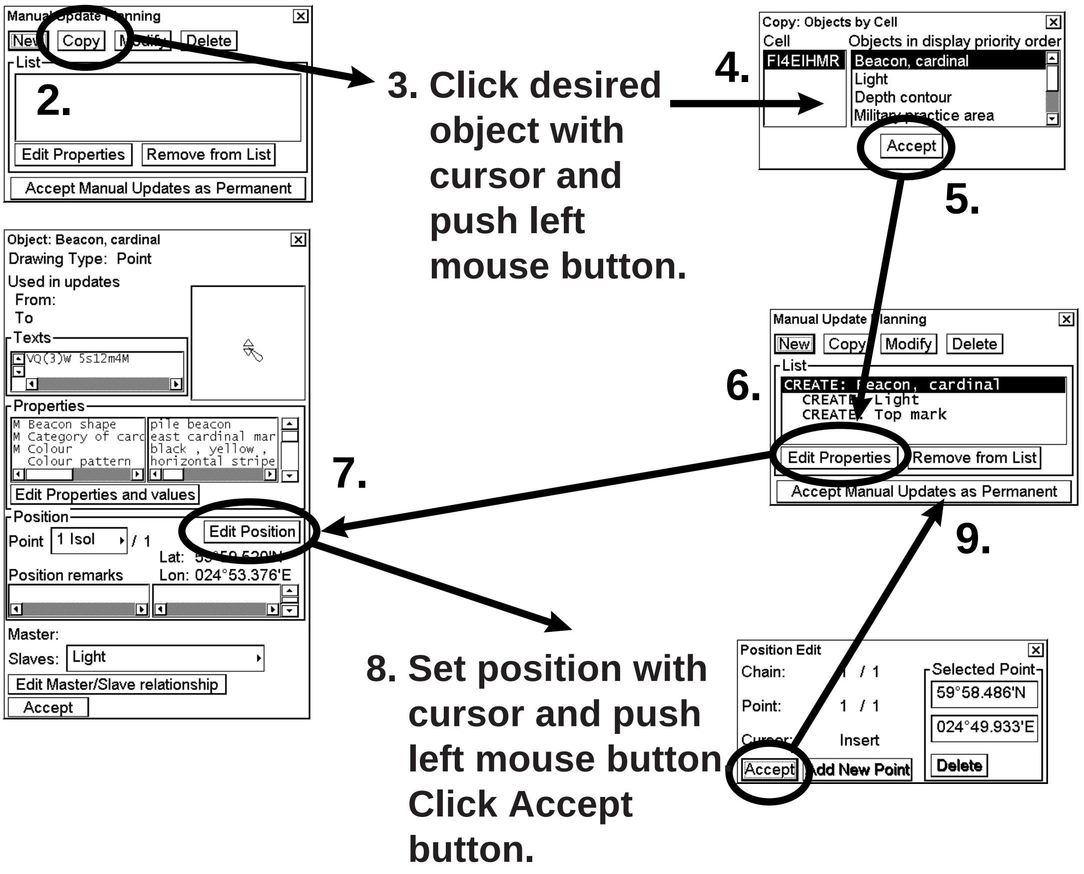
A light is only a light - it also requires a support that could be a pile or buoy, etc. Body and top mark of a buoy are separated to enable a vast number of possible combinations.

1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **New** button.
3. Choose Point as Drawing Type; choose Nav Aid as Category. Then use the cursor to choose desired icon from the master object.
4. Click the **Set as Master** button.
5. When you have set a master object, you can define nav aid slaves for it. Use the cursor to choose desired icon (for example, Light) of a slave object.
6. Click the **Set as Nav Aid Slave** button. If you need more than one slave object continue from step 5.
7. When you are ready with master and its slave objects, click the **Accept New Object** button. The new object w/slave (two lights) is shown in the list box.
8. Then, set the position of your master and slave objects. Click the **Edit Properties** button.
9. Click the **Edit Position** button.
10. Put the cursor on desired location on the chart radar display and the push the left button. Push the **Accept** button.
11. To edit the Master and Slave relationship, click the **Edit Master/Slave relationship** button and make necessary changes. Click the **Accept** button.
12. Click the **Accept** button.
13. Click the **Accept Manual Updates as Permanent** button.



### *How to insert new chart objects using "copy"*

You can make a new object by copying an existing one. Then you pick up an object and make a copy of it with all related properties. After copying, you can modify position and properties of copied object suitable for your purposes.

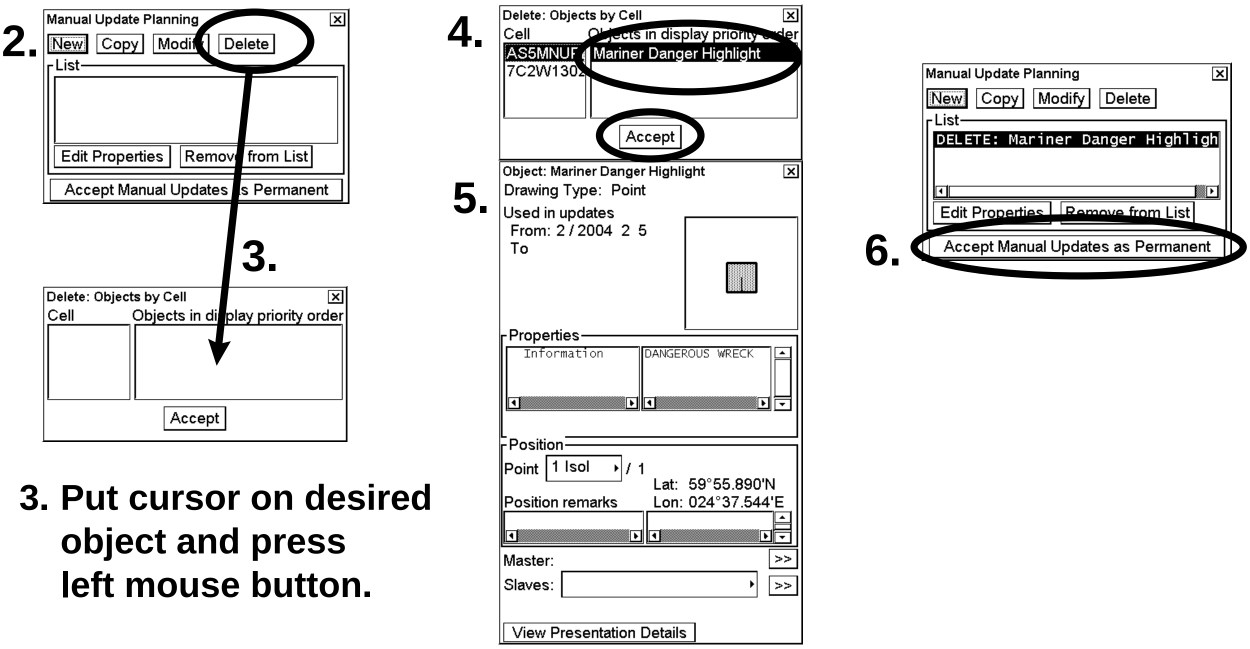


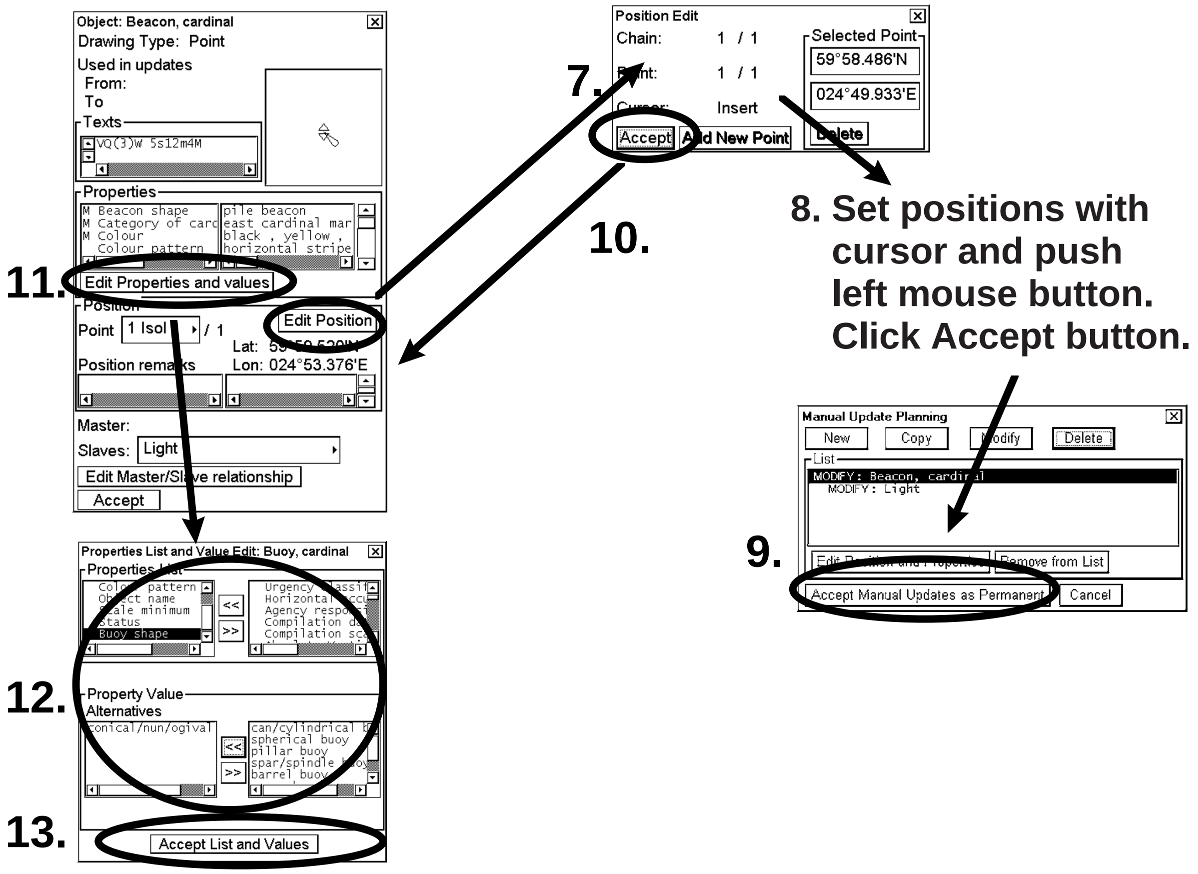

1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **Copy** button in the Manual Update Planning dialog box.
3. Put the cursor on a desired object then push the left button.
4. Choose object from the Object by Cell window.
5. Click the **Accept** button**.**
6. New object is displayed in "List of". Then, click the **Edit Properties** button.
7. Click the **Edit Position** button.
8. Put the cursor on desired location on the chart radar display. Push the left button then click the **Accept** button.
9. Click the **Accept Manual Updates as Permanent** button. (If button is hidden by window, move the window.)

### 8.5.3 How to modify chart objects

The mariner cannot permanently remove from the chart display any of the official chart objects, but he can modify position and/or properties of chart objects. When the mariner modifies a chart object, the chart radar will mark original chart object as deleted and a copy of original chart object as inserted.

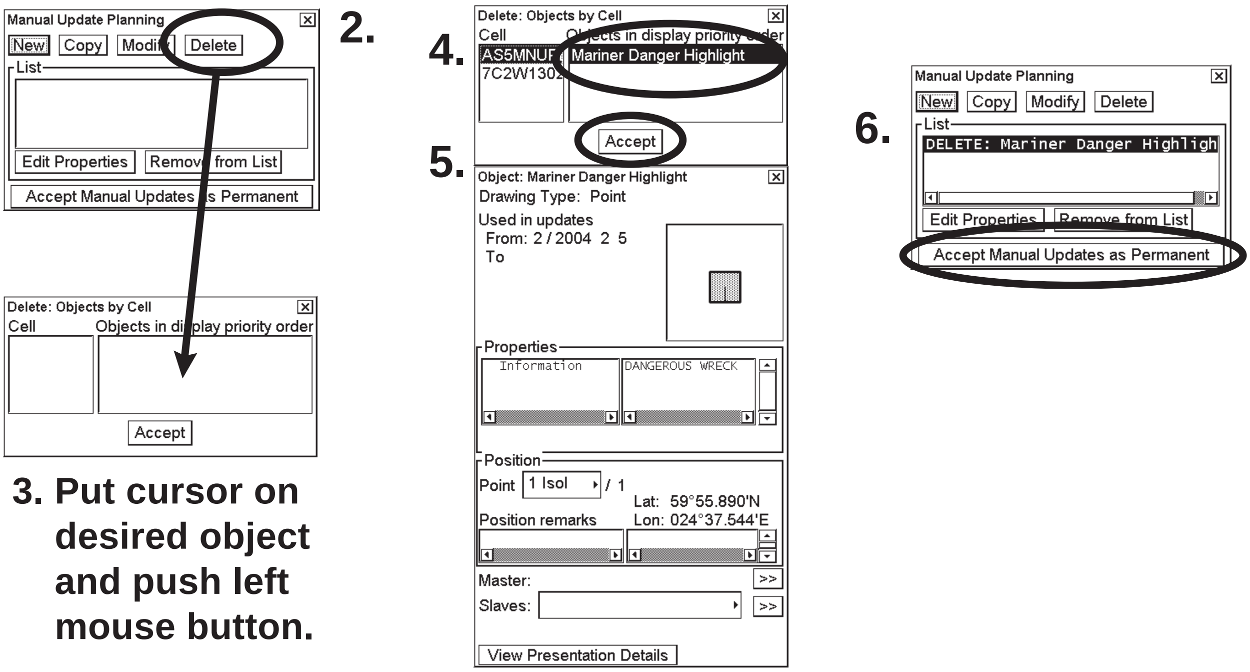
1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **Modify** button.
3. Put the cursor on the desired object then push the left button.
4. Choose the object from the Objects by Cell window. Confirm data for selected object.
5. Click the **Accept** button.
6. Click the **Edit Properties** button.
7. If you want to modify the position of the object, click the **Edit Position** button. Otherwise continue from step 13.
8. Put the cursor on the desired location on the chart radar display. Click the **Accept** button.
9. Click **Accept Manual Updates as Permanent**. If you want to modify also properties continue from step 10.
10. If you want to modify properties, also click **Accept**.
11. If you want to modify the properties of the object click **Edit Properties and values** button. Otherwise continue from step 9.
12. Pick from the list properties you want to modify and give them new values. You can also add new properties or remove old.
13. Click **Accept List and values** to continue from step 5 or 11 again. Otherwise continue from step 9.




Object: Beacon, cardinal
Drawing Type: Point
Used in updates
From:
To
Texts
VQ(3)W 5s12m4M
Properties
M Beacon shape
M Category of card
M Colour
Colour pattern
pile beacon
east cardinal mar
black , yellow ,
horizontal stripe
Edit Properties and values
Position
Point
1 Isol
/ 1
Edit Position
Lat:
Position remarks
Lon: 024°53.376'E
Master:
Slaves:
Light
Edit Master/Slave relationship
Accept
Position Edit
Chain:
1 / 1
1 / 1
Insert
Selected Point
59°58.486'N
024°49.933'E
Accept
Add New Point
Delete
7.
10.
11.
8. Set positions with cursor and push left mouse button. Click Accept button.
Manual Update Planning
New
Copy
Delete
List
MODIFY: Light
Remove from List
Accept Manual Updates as Permanent
Cancel
9.
Properties List and Value Edit: Buoy, cardinal
Colour pattern
Buoy shape
Urgency
Horizontal
Agency
Compilation
<<
>>
12.
Property Value
Alternatives
conical/nun/ogival
spherical buoy
pillar buoy
barrel buoy
13.
Accept List and Values

### 8.5.4 How to delete chart objects

The mariner cannot permanently remove any of the official chart objects from the chart display. If mariner needs to remove any of the official chart objects he is allowed to mark them as deleted. In practice the deleted chart object is still visible, but it has a special presentation for a deleted object on top of it. To delete a chart object, do the following:

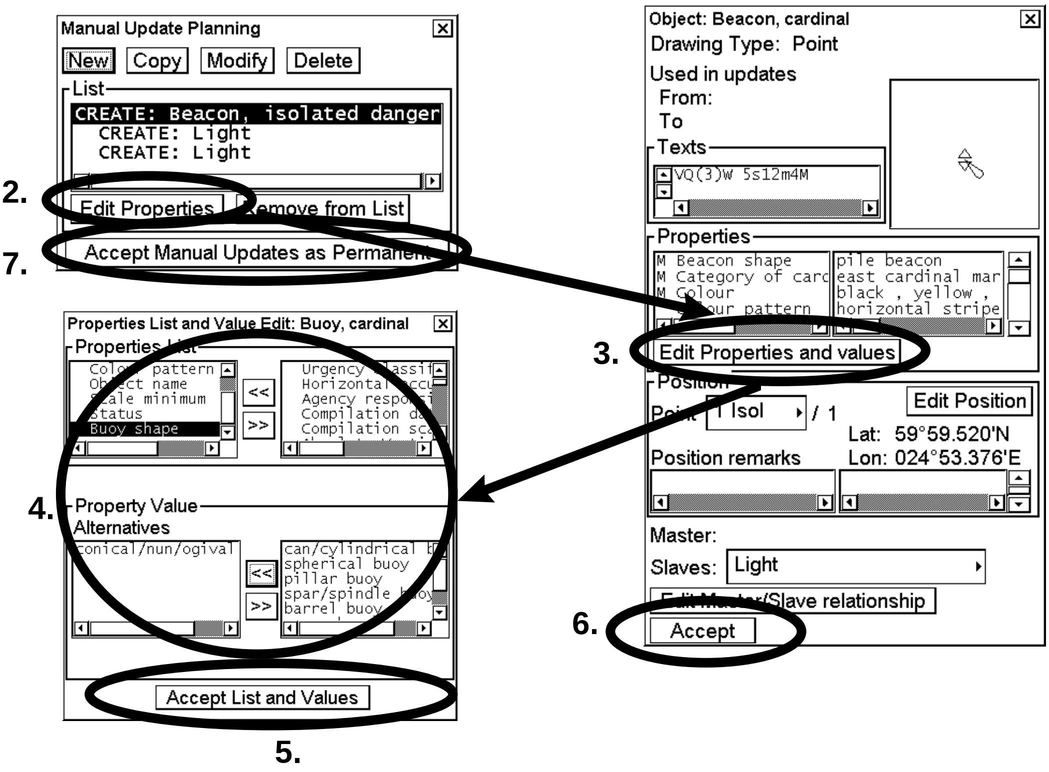



1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Click the **Delete** button in the Manual Update Planning dialog box.
3. Put the cursor on the chart object to delete then push the left button.
4. Choose the object from the Objects by Cell window. Confirm data for selected object.
5. Click the **Accept** button.
6. Click the **Accept Manual Updates as Permanent** button to complete the deletion.

**Note:** If you deleted an official ENC chart object, a deletion mark is added over the original chart object that is still visible. If you delete a manual update chart object, then it is removed from the chart display based on date of deletion.

## 8.5.5 How to edit properties of manually updated chart objects

### *How to edit properties of chart objects*

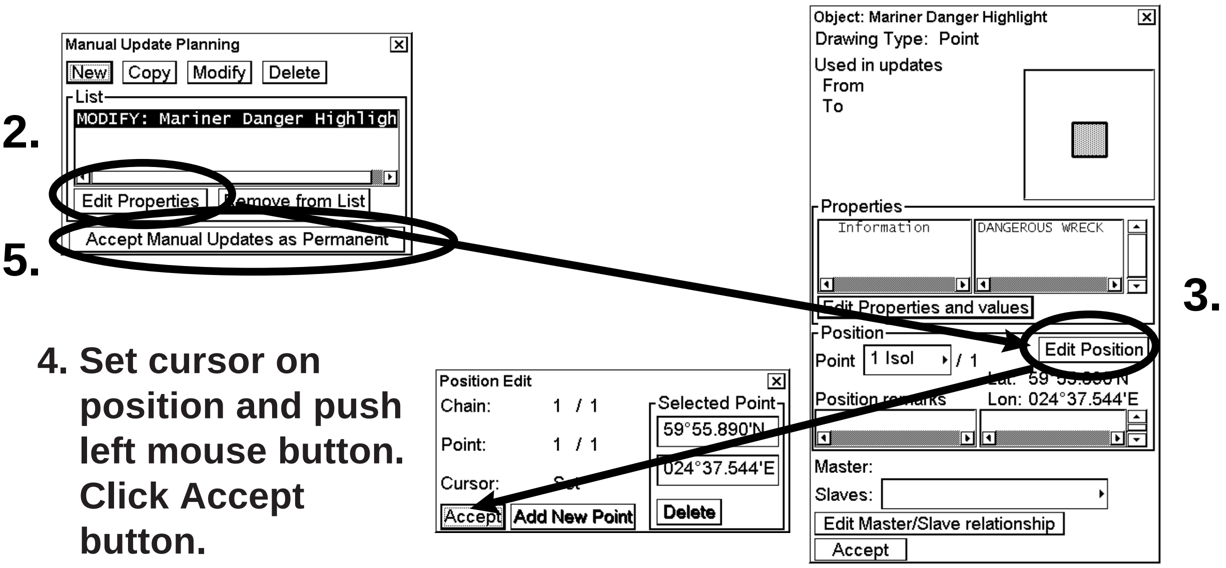



1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. In Manual Update Planning dialog box, click the **Edit Properties** button. An Object window appears.
3. Click the **Edit Properties and values** button. A Properties List and Values Edit window appears.
4. Add or remove features from/to the Properties List using >> and << buttons. To edit property value, highlight desired value in the Properties List, then you can edit in the Property Value field using Alternatives field or enter Numeric or Textual value. If the Object has a linked object, you can also edit those values. Click **Edit Master/Slaves relationship** button to edit them. Make desired modifications in the Master/Slave relationship edit window. After you have edited all the values of the linked objects, click the **Accept** button.
5. After you have edited all the values of the object you click the **Accept List and Values** button, if you want continue from step 2 with the object. Otherwise continue from step 4.
6. Click the **Accept** button.
7. Click the **Accept Manual Updates as Permanent** button.

### *How to edit position of chart objects*

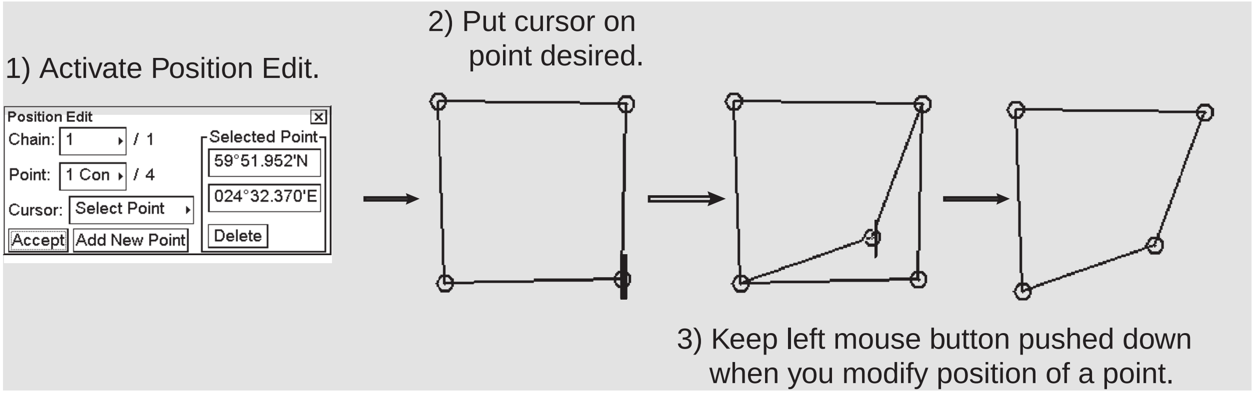
An object can be type of point, line or area.

- A Point has only one point in its presentation.
- A Line can consist of one or more chains. A chain consists of two or more points.
- An Area consists of a line that is closed.




1. Follow steps 1-3 on page 8-4 to display the Manual Update Planning dialog box.
2. Press the **Modify** button, select object on chart then click the **Edit Properties** button. Object window appears. An Object window appears.
3. Click the **Edit Position** button.
4. With the Position Edit window open, you can edit the position of the chosen chart feature. For further details, see the next several pages.
5. Click the **Accept Manual Updates as Permanent** button.

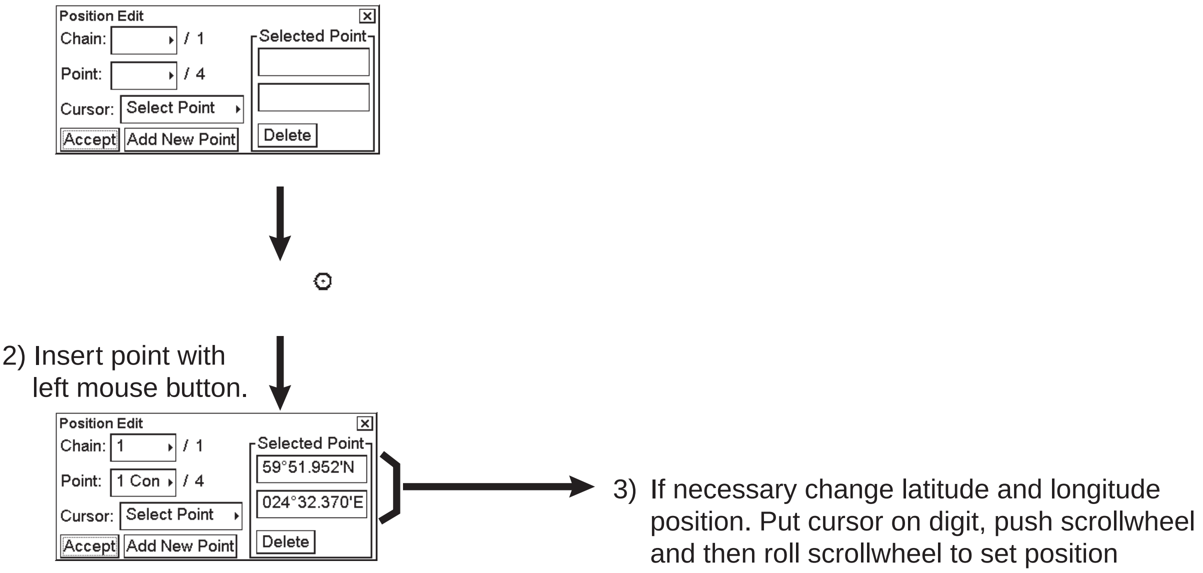
**Example of how to modify a line**



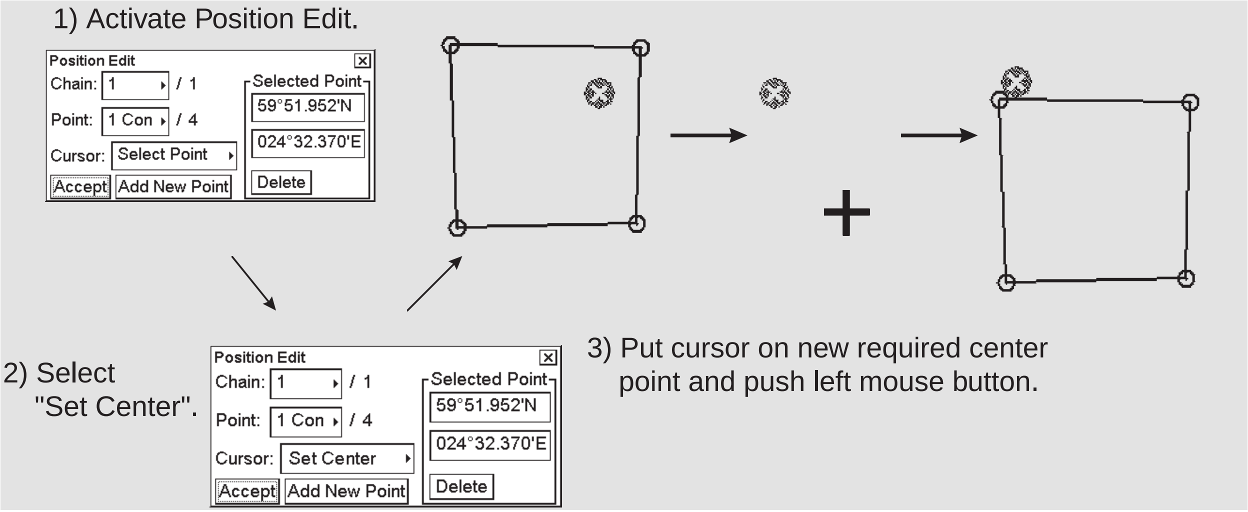
### *Example of how to set new position for a point*

The method is also applicable to insert or append new points for existing chart features.

1) Activate Position Edit.




**Example of how to define a new center point for an existing chart feature**

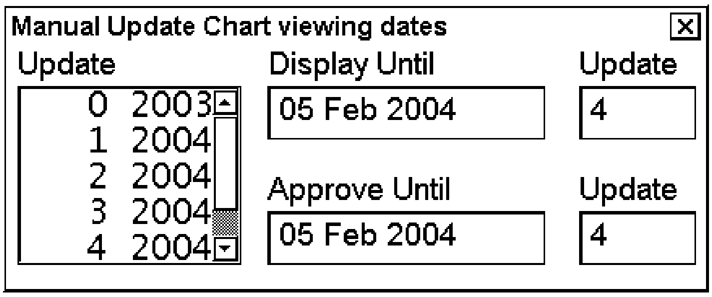


## 8.6 How to Check Creation and Usage History of Manual Updates

You can need to check when a manual update has been added into your chart radar. Also you can need to check what was shown in your chart display three weeks ago. There are also many other cases when you need to know what was known by your chart radar.

To check any situation in the past, you can use either Display Until and Approve Until to specify exact date of interest. Alternatively, you can specify directly the number of the manual update planning session. See below.

To open the Manual Update Chart viewing dates window, open the Chart menu, choose Set Chart viewing dates. In the Chart Viewing Dates window, click the **Manual Update Dates** button.



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# 9. Chart Alerts

The chart radar can detect areas where the depth is less than the safety contour or detect an area where a specified condition exists. If you plan a route or if prediction of own ship movement goes across a safety contour or an area where a specified condition exists, the system will display a visual alert or sound an audible alert to alert you to impending danger. For this function, the chart radar utilises the chart database (S57 charts) stored on the hard disk in SENC format. **Note that the chart radar calculates dangerous areas using the largest scale chart available, that may not be the visualised chart.**

You can choose objects that are included for calculation of danger area (for example, restricted areas). A window lists the various areas that activate danger warnings.

You can also define your own safe area by creating a user chart area. The system can utilise these areas when calculating chart alerts.

The chart radar can check the following for you:

- Predicted movement area of own ship
- Planned route with an easy to use locator function to find dangerous areas

The chart radar will highlight the following for you:

- Dangerous areas inside predicted movement area of the own ship
- Dangerous areas inside your monitored route
- Dangerous areas inside your planned route

# 9.1 Chart Alerts

Official S57 chart material contains depth contours that can be used for calculation of chart alerts. A chart database also includes different types of objects that the operator can use for chart alerts. The procedure for setting chart alerts is outlined below.

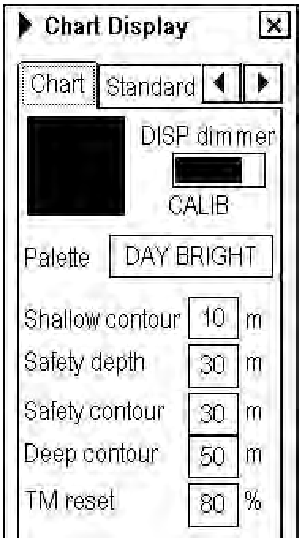
1. Choose suitable safety contour for your own ship. See section 9.1.1 How to select safety contour.
2. Check that "Chart Alerts" is set for display. See section 9.1.3 How to highlight chart alert areas. If you want chart alerts to be included in some other objects or areas, choose them for indication or alert. See section 9.1.2 How to select objects used in chart alerts.
3. In the route plan mode, define a new route or choose an existing one. Make a chart alert calculation of the route if there are indications of danger areas in the route. For more information, see section 9.4 Route Planning. Modify your route if necessary and do the chart alert calculation again.
4. Choose route as monitored route.
5. Set watch sector for your own ship.

The system is now ready for chart alert calculation of monitored route and estimated own ship position.

## 9.1.1 How to select safety contour

User has to choose safety depth suitable for the own ship. To choose suitable depth, do the following:

1. Spin the scrollwheel to display Chart Display/Info/Standard Display in the guidance area then push the left button.
2. If the Chart page is not displayed, click the triangle mark to display it.




3. Enter desired depth in the Safety contour field.

**Note:** If the chart does not contain chosen depth contour, the system will automatically choose next deeper contour.

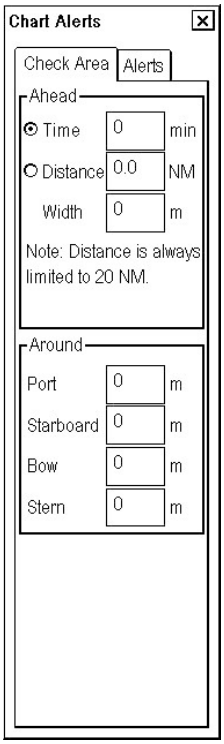
In the example above the safe water depth is set for 30 m.

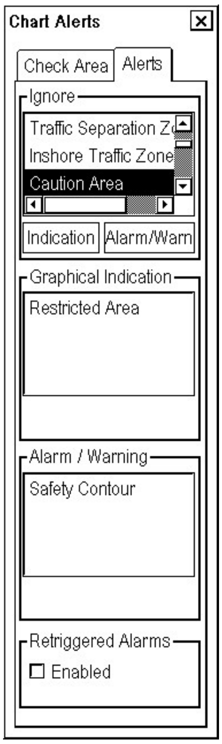
## 9.1.2 How to select objects used in chart alerts

You can also include calculation areas that have to be noted when sailing (for example, restricted areas). To include these areas in chart alerts, do the following:

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Initial Settings from the menu then push the scrollwheel.
3. Put the cursor on the triangle inside the Initial Settings dialog box to open the Initial Settings menu.
4. Choose Chart Alert parameters then push the scrollwheel.
5. Click the Chart Alerts tab to show the Chart Alerts dialog box. In the Ignore box at the top of the window, use the left button to click the alert item you wish to process.

6. Choose what alert type you desire. Click the **Indication** button to display visual alert, or **Alarm/Warn** button to get the audible alert. The item chosen is moved from the Ignore box to the Indication or Alert Box as appropriate.
7. To remove an alert, click it in the Indication or Alert Box with the left button then click the **Ignore** button. To change an alert method, click it in the Indication or Alert Box with the left button then click the **Indication** or **Alert** button as appropriate.
8. Click the Parameters tab with the left button.
9. Time and sector angle are explained in section 9.3 How to Activate Own Ship Check. Set them appropriately.




In the example at right above, a visual indication will be released when your vessel nears a User Chart Danger Area, and an audio alarm will sound when your vessel goes into a Safety Contour or a Traffic Separation Zone.

***List of areas***

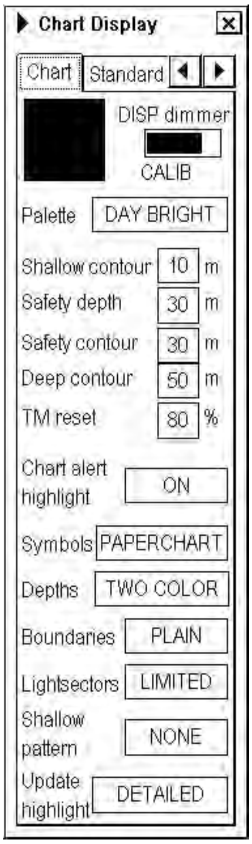
There are the areas that the chart radar detects and provides the audible alert or visual indication if estimated own ship position or planned or monitored route crosses the area defined on the Chart Alerts page. You can choose from the following areas:

- "Safety Contour"
- "Areas To Be Avoided"
- "User Chart Danger Area"
- "Traffic Separation Zone"
- "Inshore Traffic Zone"
- "Restricted Area"
- "Caution Area"
- "Offshore Production Area"
- "Military Practice Area"
- "Seaplane Landing Area"
- "Submarine Transit Lane"
- "Anchorage Area"
- "Marine Farm / Aquaculture"
- "PSSA Area"

## 9.1.3 How to highlight chart alert areas

The user can choose to highlight chart alert areas. Follow the procedure below to turn alert area highlighting on.

1. Spin the scrollwheel to show Chart Display/Info/Standard Display then push the left mouse button.
2. Click the right or left arrow tab to choose the Chart page, as shown right.
3. In the Chart Alert box, choose ON position to highlight alert areas.



## 9.2 How to Insert User Chart Symbols, Lines and Areas in Chart Alert

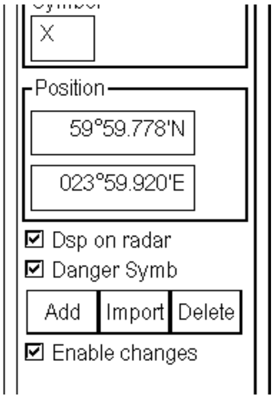
### *Symbols*

For user chart symbols, use the option Danger Symbol in the Symbol page of the Plan User Chart dialog box. To display this box, do the following:

1. Put the cursor on User Chart in the sidebar then click the left button to open the User Chart dialog box.
2. Click the **Plan** button to show the Plan User Chart dialog box.
3. Put cursor on black triangle on Plan User Chart dialog box then left-click.
4. Click Select or Create.
5. Select or enter user chart name then click the **OK** button.
6. Click the Symbol tab.

To include symbols in the chart alert, first check the Enables changes box then check the Danger Symbol box of the Plan User Chart dialog box. Danger Symbol must checked, otherwise danger symbols of a user chart cannot not be used in the chart alert. The dangerous symbol is drawn in red instead of dark yellow (color may be different depending on Palette in use).

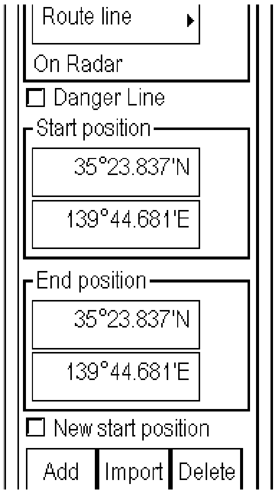
In the Symbol page, you can include symbols in the chart alert by checking Danger Symbol.




### *Lines*

To include lines in the chart alert, check the Danger Line box in the Line page of the Plan User Chart dialog box. Danger Line must checked, otherwise danger lines of a user chart cannot not be used in the chart alert. The dangerous line is drawn in red instead of dark yellow (color may be different depending on Palette in use).

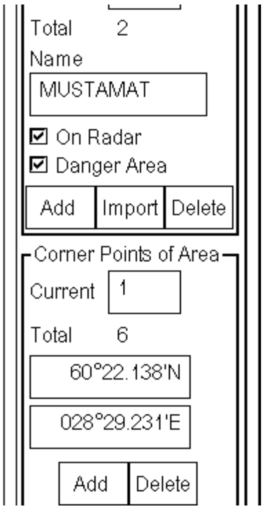
In the Line page, you can include lines in the chart alert by checking Danger Line.



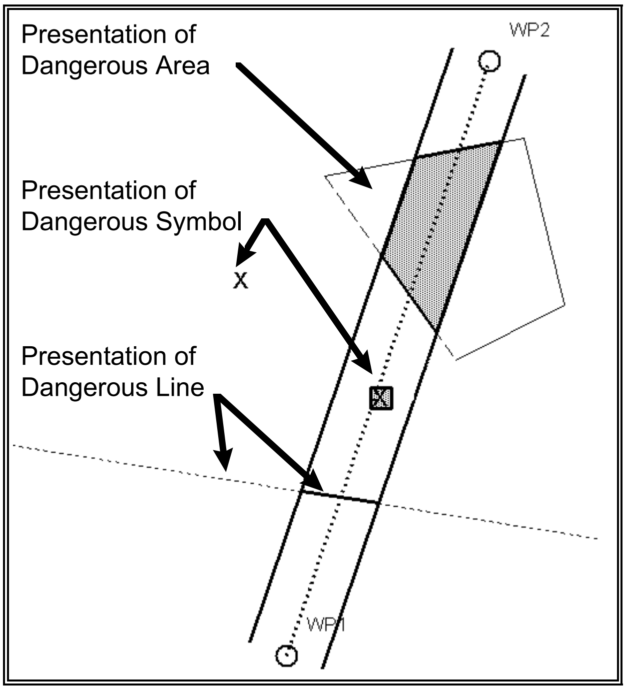
### *Areas*

To include areas in the chart alert, check the Danger Area box in the Area page of the Plan User Chart dialog box. Danger Area must checked, otherwise danger areas of a user chart cannot not be used in the chart alert. The dangerous area is drawn in red instead of dark yellow (color may be different depending on Palette in use).

In the Area page, you can include areas in the chart alert by checking Danger Area.

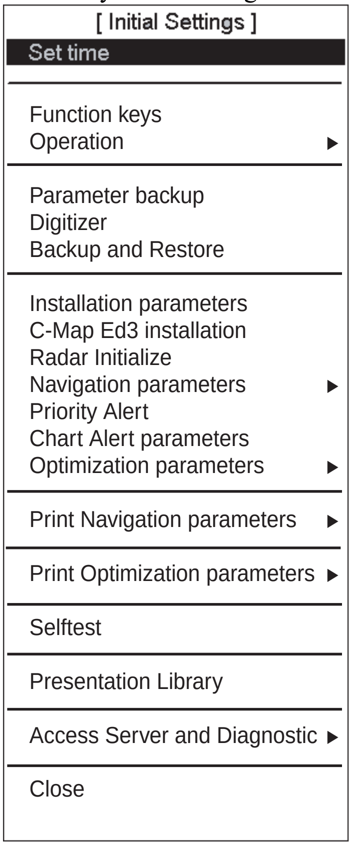



*The figure below shows the behavior of a dangerous symbol, line and area in the chart alert check.*

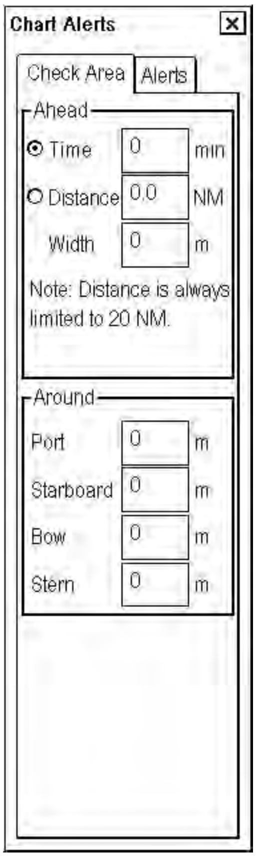


# 9.3 How to Activate Own Ship Check

Calculation of own ship predicted movement area is done using watch sector from own ship position. Sector size is defined by time and angle. To set them, do the following:



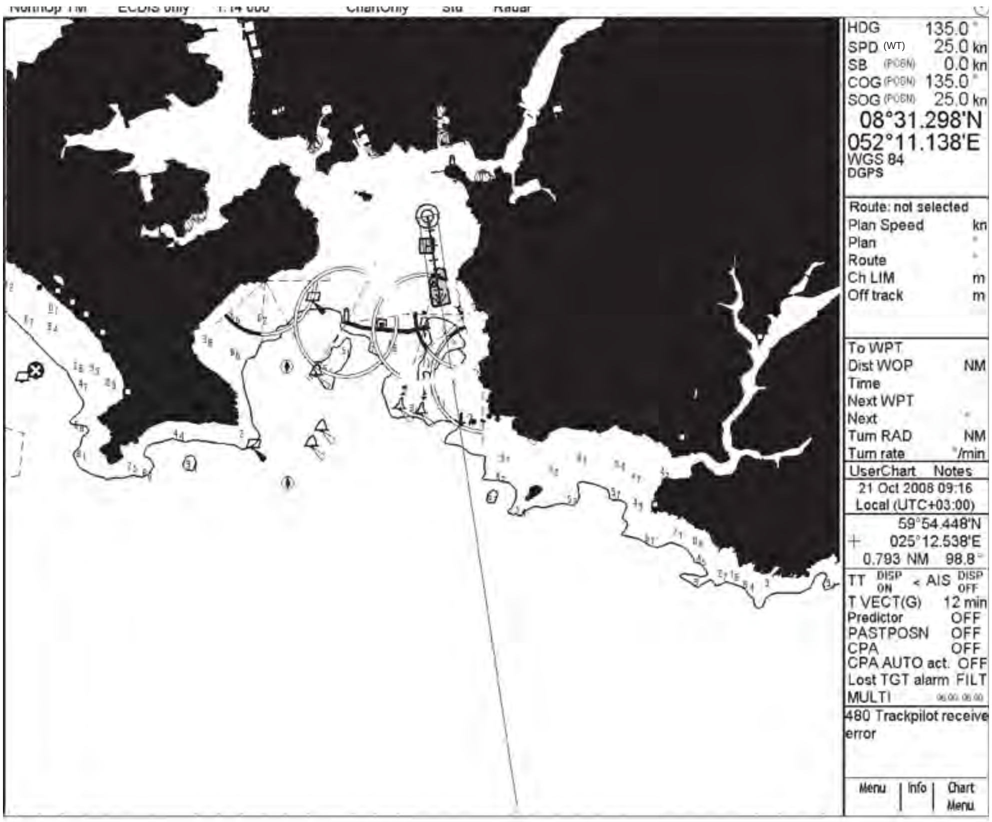

1. Spin the scrollwheel to show Menu/Info/Chart menu in the guidance area then push the left button.
2. Roll the scrollwheel to choose Initial Settings then push the scrollwheel.
3. Put the cursor in the Initial Settings dialog box to show the menu displayed at left.
4. Spin the scrollwheel to choose Chart Alert parameters from the menu then push the scrollwheel.
5. Click the Check Area tab.




6. Set the ahead time or distance and ahead width.
7. Click the X at the top right corner to close the dialog box.

**NOTICE:** Chart alert area is always referred to conning position.

The figures below show how a watch sector is displayed on the chart radar display.



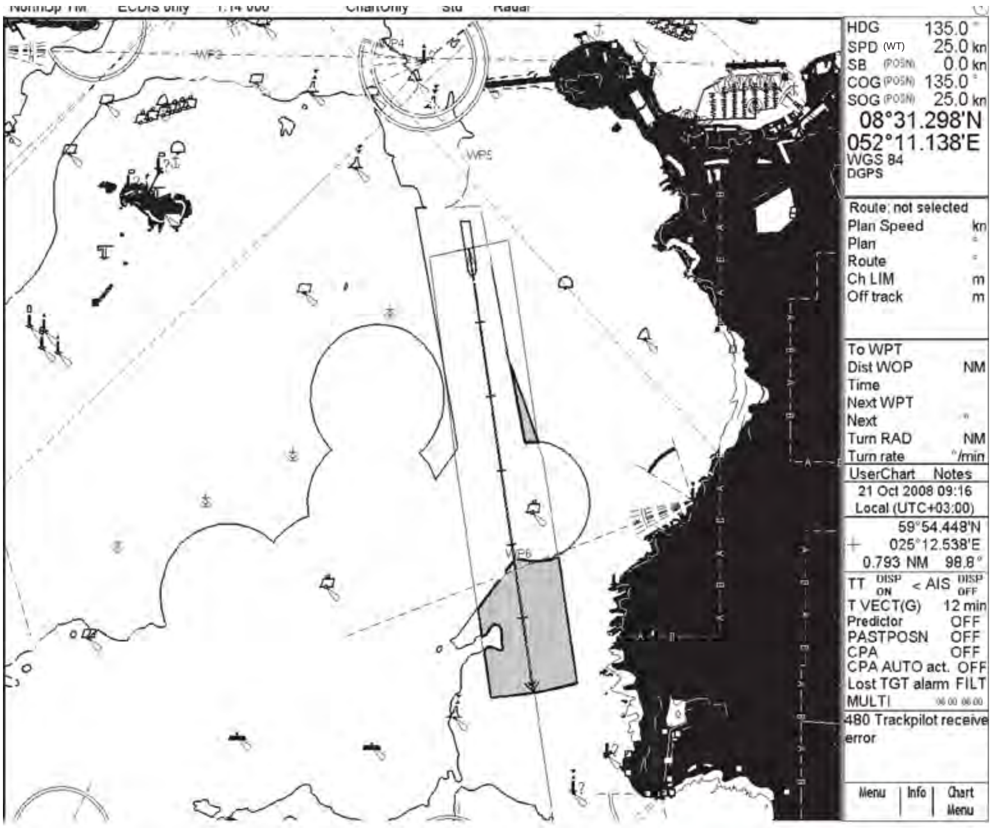




Chart alert always uses the largest scale chart available no matter which chart is chosen for display.

# 9.4 Route Planning

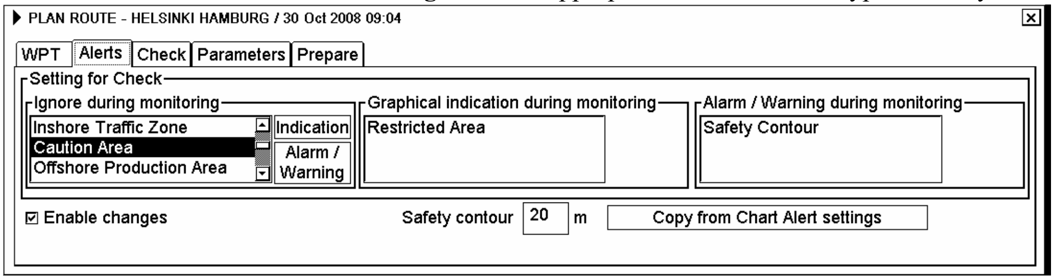
The system will calculate chart alerts using user-defined channel limit for routes. Danger areas are shown highlighted if safety contour or user-chosen chart alert areas are crossed by the planned route. For more information on route planning, see Chapter 10.

**Note:** If your voyage is going to take a long time or you are planning it much earlier than it is to take place, use display and approve dates corresponding to the dates you are going to sail.

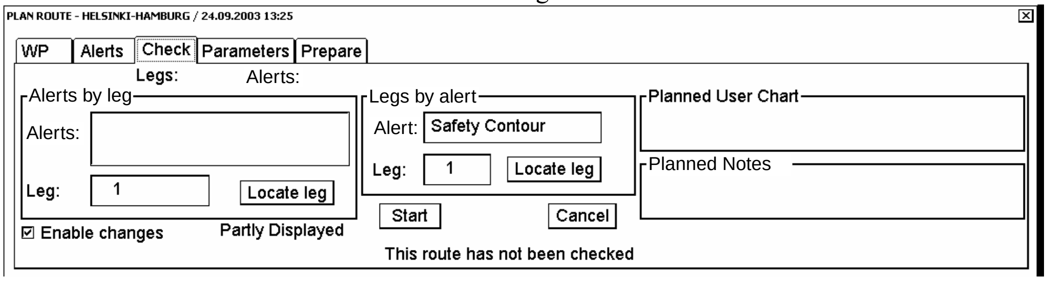
## 9.4.1 Chart alerts for route planning

You can generate a list of chart alerts that cross by the planned route. This can be done as follows:

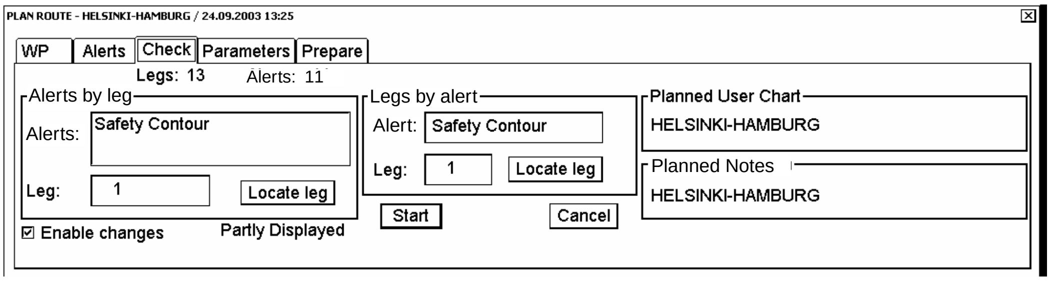
1. Enter safety contour you want to use. See section 9.1.1 How to select safety contour.
2. Plan a route; define waypoints and other necessary information. See Chapter 10.
3. Choose dangerous objects to be monitored during route monitoring, on the Alerts page in the Plan Route dialog box, shown below.
   a) Open the Plan Route dialog box by selecting User Chart and Plan in the sidebar.
   b) Click the Alerts tab.
   c) Check the Enable changes box, then click the alert to process from the Ignore during monitoring list then click the **Indication** or **Alarm/Warning** button as appropriate to choose what type of alert you want.




4. Click the Check tab then click the **Start** button to generate a list of chart alerts.




The system will check a route leg by leg and when finished you will see the number of Legs and Alerts below the tab buttons.

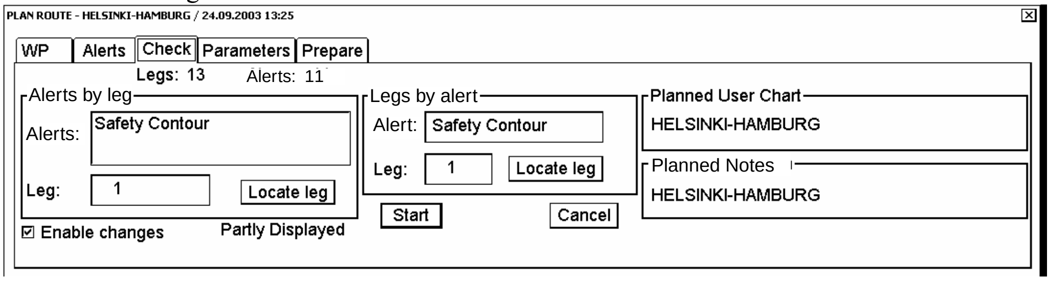



The figure above shows the alerts to be monitored. If there are alerts included in the planned route, check alerts leg by leg, or check alerts by using category of alert.

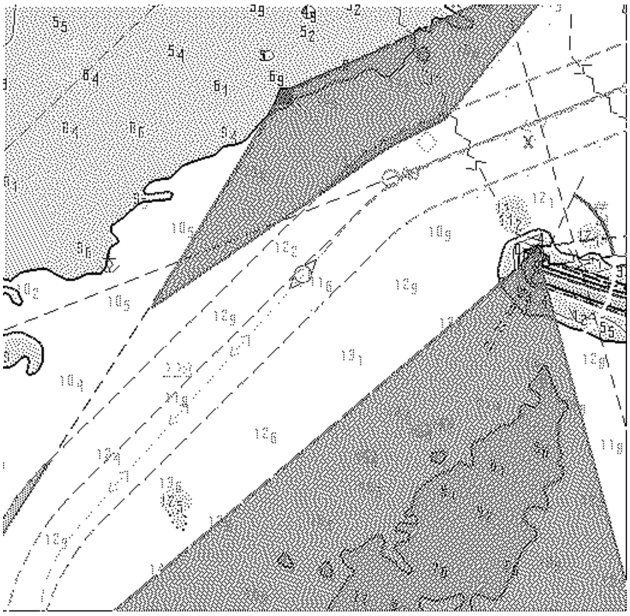
### 9.4.2 How to find chart alerts leg by leg

After you have done chart alert calculation, the system is able to show you legs on the route where danger areas are located. All the alerts for each leg where alerts occur are shown in the Alerts list. The list of alerts is based on selections made in the Chart alert parameters sub menu. To find chart alerts by route leg, do the following:

1. In the Check page of the Plan Route dialog box, the Alerts by leg field has a selection box where you can choose desired leg number.



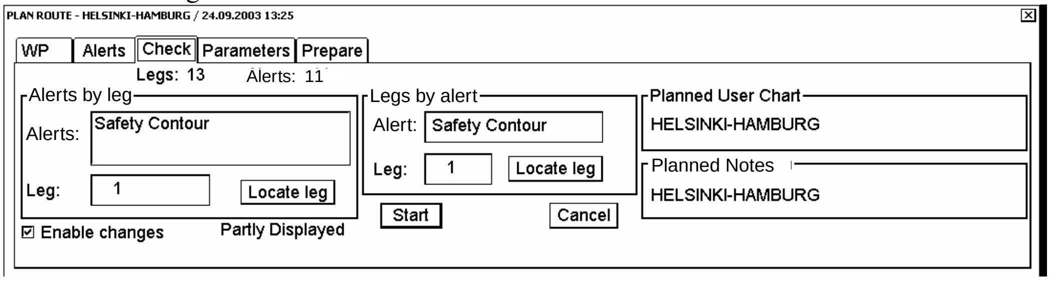

2. Choose the Alert from the Alerts by leg field then click **Locate leg** button. The system will display chosen leg on the electronic chart area as shown below.



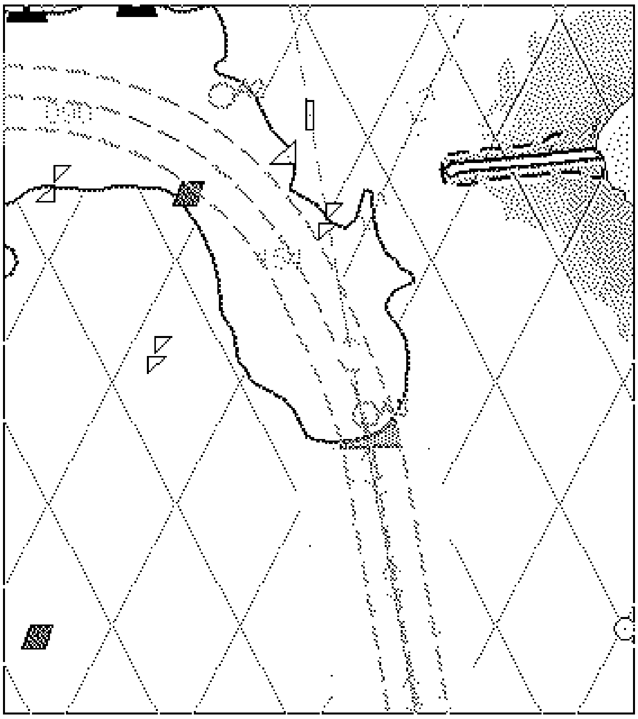
### 9.4.3 How to find chart alerts by category

After you have done chart alert calculation, the system is able to show you legs on the route where the chart alerts are located. The system can show alerts by their category. To find chart alerts for a route by alert category, do the following:

1. In the Check page of the Plan Route dialog box, the Legs by alert field has a selection box where you can choose desired leg number.

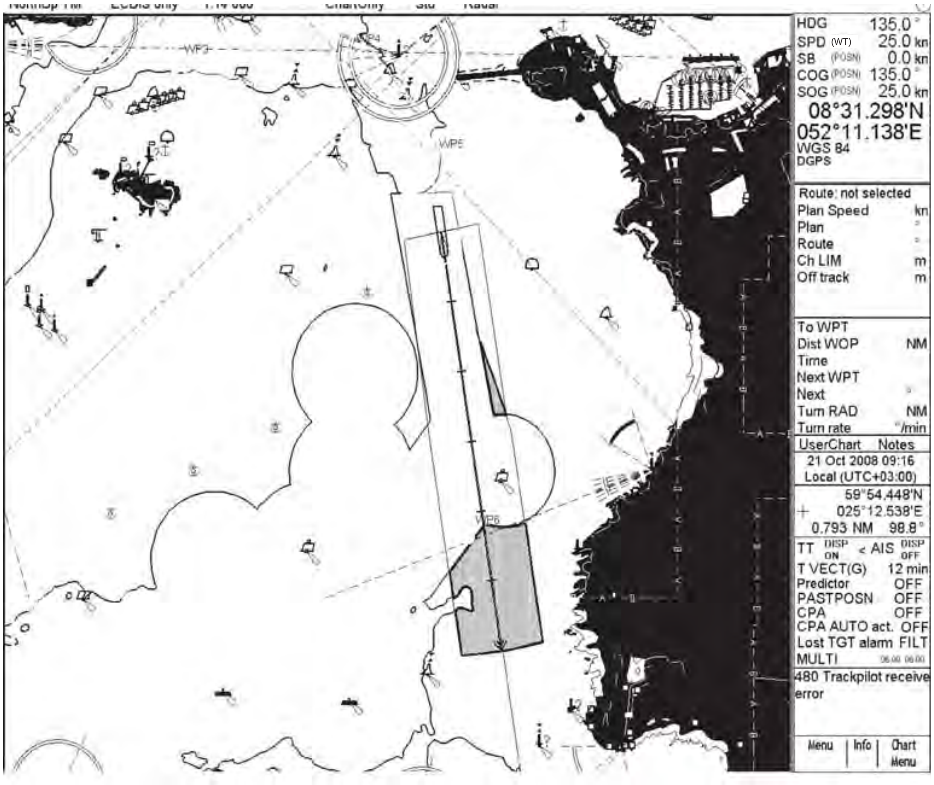



2. Choose the leg number from the Leg field then click **Locate leg** button. The system will display chosen leg on electronic chart area as shown below.



## 9.5 Route Monitoring

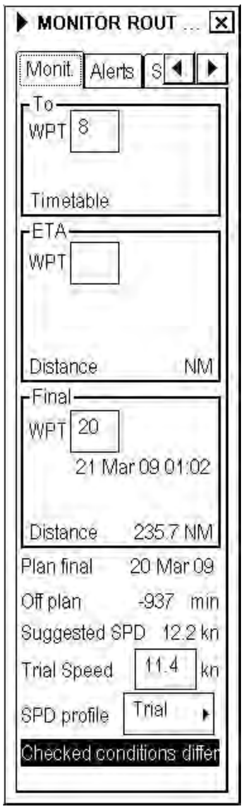
Route monitoring can be divided into two categories: own ship estimated position and monitored route.




The figure above shows how the system highlights chart alerts inside channel limits of a monitored route and inside predicted movement area of own ship.

**Note:** The system has a route monitor that facilitates safe use of routes. You can check your route plan for safe water and you can attach a user chart and Notes that you intend to use together with a route plan. To show the route monitor, choose Route-Monitor in the sidebar then push the left button to show the Monitor Route dialog box.

If the text "Checked conditions differ" appears at the bottom of the Monitor Route dialog box, use the Alerts page in this dialog box to verify difference between actual and planned situation.



# 10. How to Plan Routes

A route plan defines the navigation plan from starting point to the final destination. The plan includes:

- Route name
- Name, latitude and longitude of each waypoint
- Radius of turn circle at each waypoint
- Safe channel limits
- Chart alarm calculation based on channel limits against chart database and user chart danger
- Deadband width, nominal deadband width used for operating modes with moderate accuracy and economical sailing behavior
- Minimum and maximum speed for each leg
- The navigation method (rhumb line, great circle)
- Fuel saving
- ETD for the first waypoint
- ETA for the last waypoint
- Ship and environmental condition affecting the ship speed calculation
- Name of the user chart to use during route monitoring together with this planned route
- Name of the Notes to use during route monitoring together with this planned route

Using the above-mentioned data, the system calculates speed, course and length for each leg, ETAs for each waypoint, fuel consumption and WOP. It also calculates safe water areas based on user-defined channel limits. The calculated data is displayed in tabular form, which can be printed as a documented route plan and also stored in a file for later use.

Main functions of route planning are:

- Define waypoints
- Define turnings for each waypoint
- Define channel limits for each leg (a leg is the line connected between two waypoints). The channel limits are used to detect chart alerts when you are planning or monitoring your route.
- Define the speed for each leg
- Calculation for ETD and ETA
- Calculation for most economical sailing

**Note: Limitation of displayed route**

If you have small scale chart(s) on display having the whole eastern/western (0-180°E/0-180°W) hemisphere and a part of the other hemisphere on display, there is a limitation to display a route. To avoid this, set chart center so that the whole eastern/western hemisphere is not on display

## 10.1 Main Menu for Route Planning

The main parameters for the route planning are:

- Latitude and longitude of the waypoint
- Channel limits to the waypoint
- Turning radius of the waypoint
- Maximum and minimum speed limits for a leg

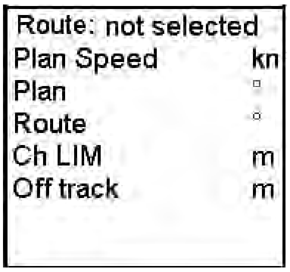
There are two phases for a route: Route Plan and Route Monitor. Route plan is used for planning the route and route monitor is used to control a route for monitoring.

To complete route planning, do the following

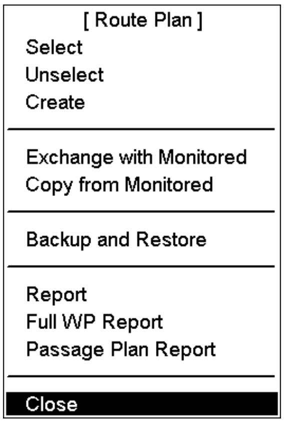
1. Create a new route or choose an existing one. See section 10.3 How to Create a New Route.
2. Modify your route if necessary. See section 10.4 Modifying an Existing Route..
3. Make chart alert (safe water) calculation. See section 10.3.3 How to use the Check page.
4. Optimize your route. See section 10.5 Route Optimization.

### *Description of Route Plan menu*

1. Put the cursor on Route in the sidebar, and the following dialog box appears:




2. Click the **Plan** button to open the Route Plan dialog box. The Plan Route dialog box appears together with the Route Plan menu, shown below.
3. The Route Plan menu is where you select, unselect or create a route. If it is not shown, that is, a route has been selected, you can show it by placing the cursor on the triangle in the Route Plan dialog box.




**Select:** Choose an existing route and edit it for use. Choose Select from the menu then push the scrollwheel, and a list box appears. Spin the scrollwheel to choose appropriate route from the list box, push the scrollwheel to confirm then click the **OK** button.

**Unselect:** Deselect a route here. The operation is similar to how you select a route.

**Create:** Create a new route. An input box appears; enter name for new route, using the scrollwheel. The route name may have up to 30 alphanumeric characters..
**Exchange with Monitored:** This function exchanges planned and monitored routes. Planned route is used both as alternative route and as an editable route.

**NOTICE:** Before using this function, set the next TO WPT on the Prepare page of the Plan dialog box. If this is not done, and unintended waypoint could become the TO WPT. If this occurs, right-click the TO WPT then enter correct WPT.

**Copy from Monitored:** Copy monitored route to plan route.

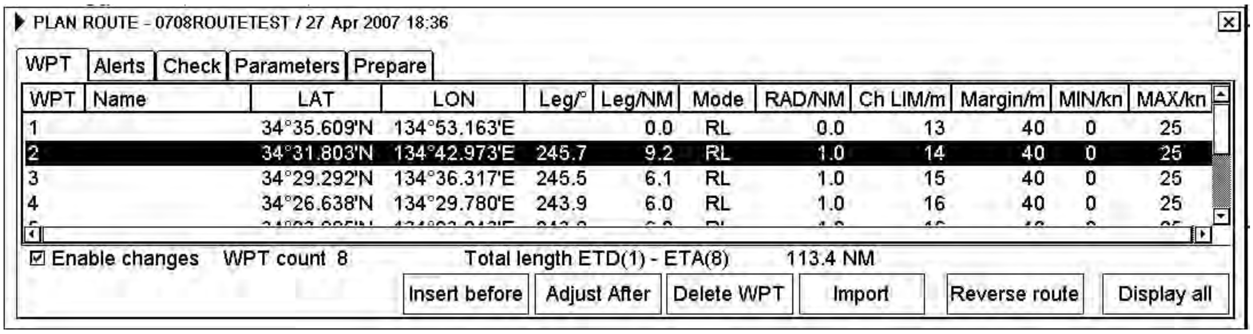
**Backup and Restore:** You can make a backup of a route to a floppy disk or restore a route from a floppy disk. See Chapter 14 Backup Operations.

**Report:** Generate report of planned route.

**Full WPT Report:** Generate detailed report of planned route.

**Passage Plan Report:** Generate a combined report from active planned route and active Notes.

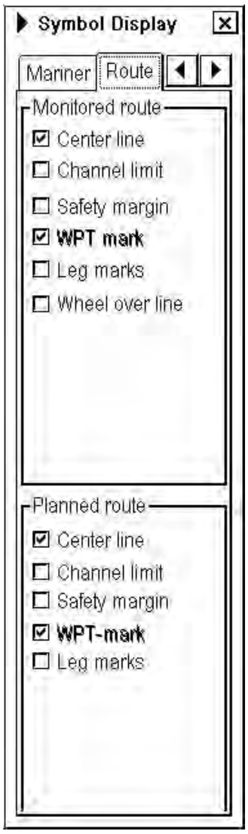
**Note:** To display a planned route, make sure that desired options of the planned route (Center line, Channel borders, WPT marks, Leg marks, etc.) are chosen to either Std or Other on the Route page in the Chart Display dialog box.




Spin the scrollwheel to display Symbol Display/Info/ in the mouse functions area then click the left mouse button to open the Symbol Display dialog box. Click the arrow tabs or right mouse button to choose the Route page.

- "Planned route" options only available in ECDIS mode.
- "WPT mark" cannot be turned off.

-

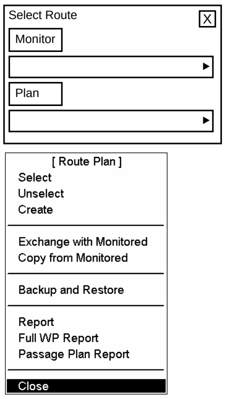



## 10.2 How to Select Datum

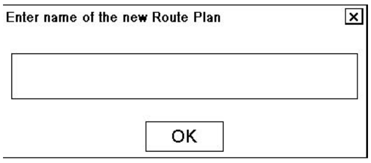
Selection of datum is very important, especially if you manually enter latitude-longitude positions or if you use a digitizer. If you use the cursor to add and to modify waypoint locations, then you could use any datum, although it is recommended to use native datum of the chart. For more information to choose datum, see section 12.3.

# 10.3 How to Create a New Route

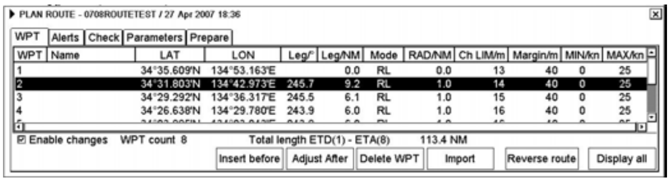
2.



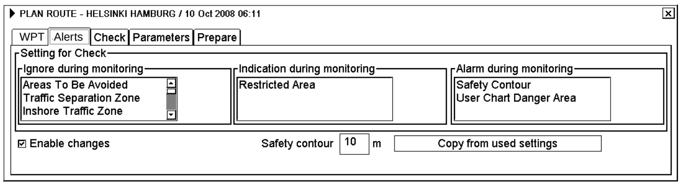

5.



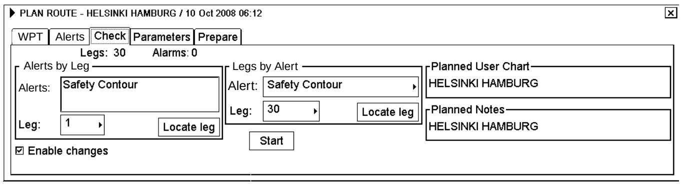

6.



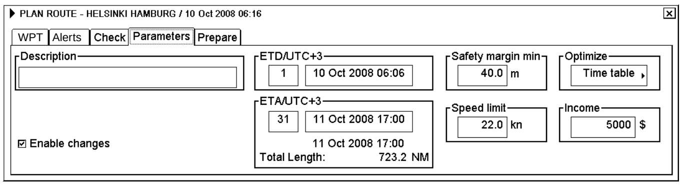

7.




8.




9.

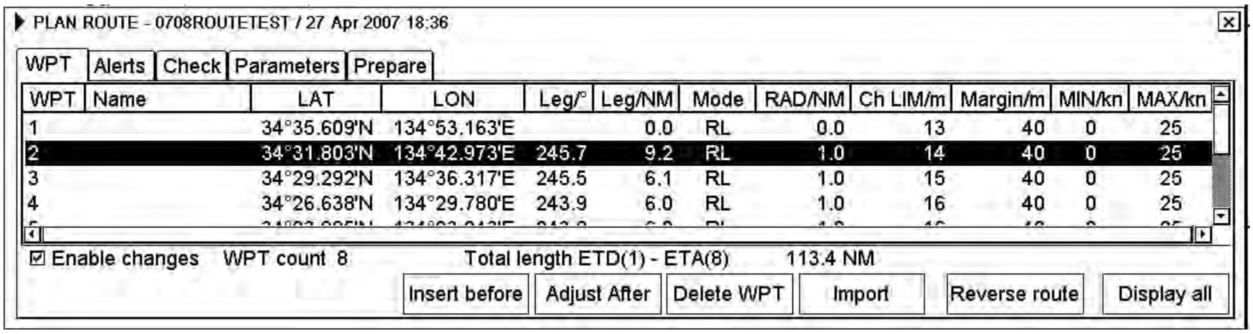



To make a complete route for a voyage, do the following:

1. Left-click Route in the information area.
2. Left-click the **Plan** button to open the Plan Route dialog box.
3. Put the cursor on the triangle in the dialog box to show the Route Plan menu.
4. Choose Create.
5. Enter a name (max. 30 alphanumeric characters) for the route by spinning the scrollwheel to choose character desired and confirming desired character by pushing the scrollwheel. When name is ready, click the **OK** button.
6. Check Enable changes in the Plan Route dialog box. Choose position of a waypoint by placing the cursor on the location desired on the electronic chart display then pushing the left mouse button. After entering a waypoint, edit Name, Steering mode, Radius, Channel limit, Safety margin and Speed (Min, Max) as appropriate in the Plan Route dialog box. (Put the cursor on an item, spin the scrollwheel to change value then push the scrollwheel.) Do this for all waypoints of your route.
7. Use the Alerts page to define safety contour and other specified conditions for checking the route. Choose item from a list then click **Indication** (to get a visual indication), **Alarm** (to get the audio alarm) or **Ignore** (to remove check item) button as appropriate.
8. Use the Check page to detect areas where depth is less than the safety contour or where specified conditions exist. The ECDIS can examine chart database against planned route to make a list of alerts where a route crosses a safety contour or specified areas used in chart alerts. To create a list of alerts, click the **Start** button.
9. Use the Parameters page to enter Estimated Time of Departure (ETD) and Estimated Time of Arrival (ETA), if you are using Time table optimizing. Choose desired optimizing mode from the Optimize window.

To print a waypoint report, open the Plan Route dialog box, put the cursor on the triangle to show the Plan Route menu, choose Report or Full Report from the menu then push the scrollwheel. Click the **Print Text** button. (If you want to change the font size, put the cursor on the triangle, choose font size then push the scrollwheel, before clicking the **Print Text** button.)

### 10.3.1 How to process waypoints




Following fields and buttons can be found in the WPT page.

**Enable changes:** Check to edit waypoints.

Note: Routes can only be modified in the North-up or Course-up mode.

**WPT:** Each waypoint has a number.

**Name:** You can name each waypoint.

**LAT:** WPTs latitude co-ordinate is displayed in chosen datum.

**LON:** WPTs longitude co-ordinate is displayed in chosen datum.

**Leg/°** Bearing of leg

**Leg/NM:** Leg's length (nm)

**Mode:** Define steering mode, rhumb line or great circle, for each leg.

**RAD/NM:** Define turning radius for each waypoint.

**Ch LIM/m :** Define channel limit for each leg.

**Margin/m** Define extension for channel to be checked against selected alerts.

**(Spd) MIN/kn:** Define minimum speed of ship used with a leg.

**(Spd) MAX/kn:** Define maximum speed of ship used with a leg.

**Insert before:** Insert a new waypoint before the current waypoint.

**Insert after:** Add a new waypoint after current waypoint. You can define direction and distance for next waypoint. (If the waypoint is not the last waypoint in a route, the button name changes to Adjust after).

**Delete WPT:** Delete current waypoint.

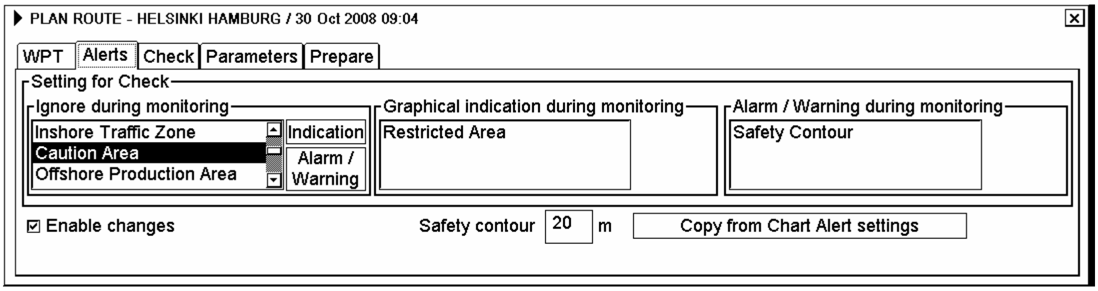
**Import:** Import new waypoints from already existing routes into your current route.

**Reverse route:** Reverse sailing order of the entire route.

**Display all:** Center line, channel borders, WPT marks and leg marks are made visible on top of the electronic chart.

### 10.3.2 How to use the Alerts page

The Alerts page lets you define conditions along a route for which you want to be alerted, by visual or audible indication. (You cannot get both visual and audible indications for a condition.) You can choose safety contour and chart alerts used to check the safety of the route. This allows you to check safety with conditions different from those chosen for system use. This is useful when making a route for different loading or sailing conditions.




**Enable changes** — Check here in order to enable editing.

**Note:** A route may only be modified when using the north-up or course-up mode.

**Ignore during monitoring** — Chart objects in this list box are not used for chart alert calculation.

**Indication during monitoring** — Chart objects in this list box are used for chart alert calculation. Only the visual alert is released.

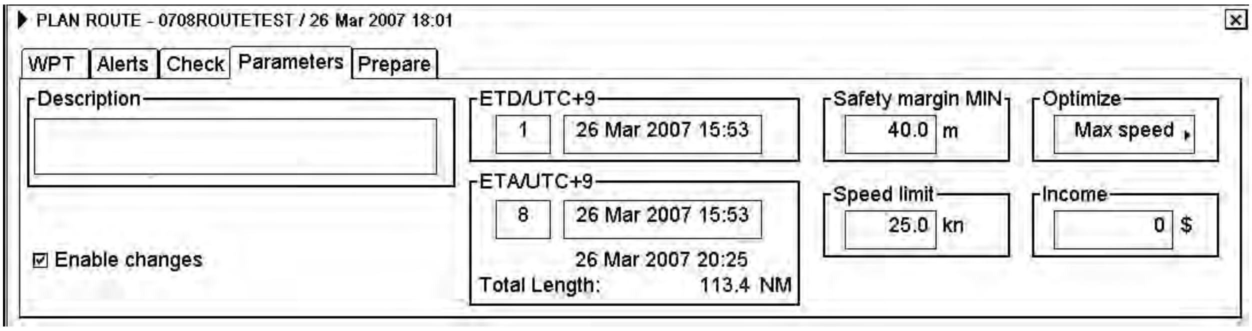
**Alarm/warning during monitoring** — Chart objects in this list box are used for chart alert calculation. Both visual and audible alerts of chosen chart objects are generated by the system.

**Safety contour** — Deep contour chosen for chart alert calculation

**Copy from Chart Alert settings** — Copy system settings to here.

### 10.3.3 How to use the Check page

The Check page allows you to make safe water calculation for your route. You also store the names of the user chart and Notes to use during route monitoring together with planned route on this page. This storage happens when you activate the safe water calculation by pushing the **Start** button. The stored names are the names of the planned user chart and planned Notes.




The time used for the Chart Alert check is subject to chart data base and route distance. When the **Start** button is clicked, one of the dialog boxes shown right appears as a reminder. To continue, click the **OK** button.

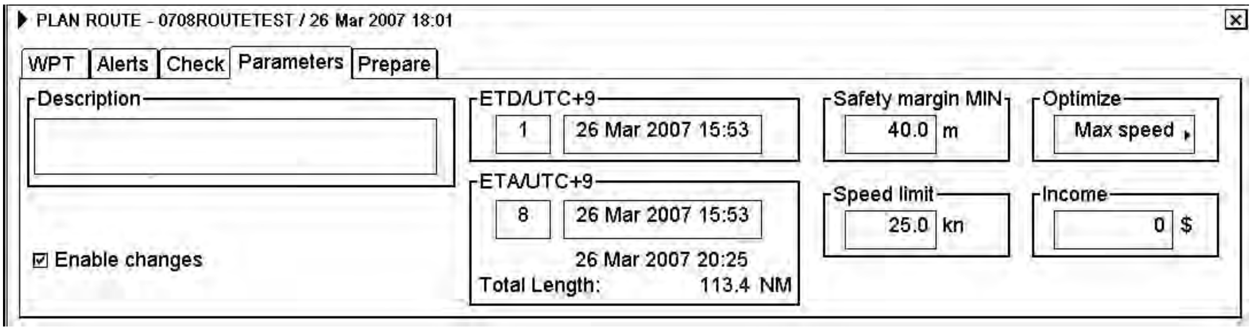
If selected scale for displayed chart(s) is smaller than 1:5000 000, Chart Alert calculation is not performed. In this case use scale range 1:1 000 – 1: 500 00 .

**Note 1:** In order to display charts with correct updated situation, always use current date during your voyage. If your voyage lasts more than one week, set current date at least once per week during your voyage.

**Note 2:** In order to display charts with correct updated situation during route planning, always use planned date of each waypoint to check your plan.

## 10.3.4 How to use the Parameters page

The Parameters page allows you to set departure time and arrival time for your route. Also optimisation type is chosen in this page.




**Enable changes:** Check in order to enable editing.

**Note:** A route may only be modified when using the north-up or course-up mode.

**Description:** Enter note concerning the route.

**ETD/UTC:** Planned estimated time of departure from a specified waypoint.

**ETA/UTC:** First part is planned estimated time of arrival to last waypoint. ETA can be calculated between two specified waypoints.
Second part is calculated ETA that may differ from planned ETA if it is impossible for them to agree with chosen optimization method. Also total length of the route is displayed.

**Safety margin MIN:** Define extension for channel to be checked against selected alerts.

**Speed limit:** Set speed limit for a route.

**Income:** Budget for this voyage. ( Income * 1000$)

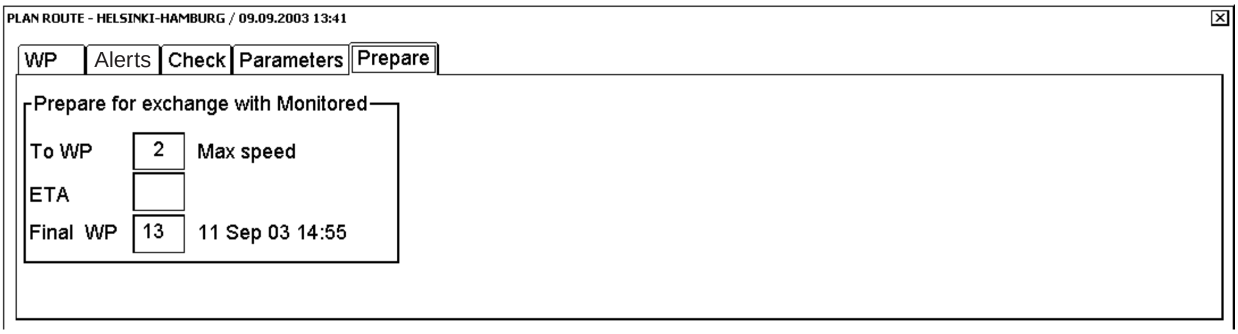
**Optimize:** Optimize types are max. speed, timetable, max profit and min. cost. (Description is provided in section 10.5.1 "Available route optimization strategies".

### *How to optimize your route*

After all waypoints are inserted and you have made safe water calculation, you can optimize your route. If not chosen, then optimisation will be done automatically with max. speed. If you want do optimization with specific strategy, see section 10.4.1 Parameters.

## 10.3.5 How to use the Prepare page

The Prepare page allows you to prepare for exchange of planned route with monitored route. Use this page if you are going to use the exchange function to choose planned route as monitored route. If you do not use this page to define To WPT and Final WPT for steering in the plan mode, chart radar will choose the most suitable To WPT based on own ship position and Final WPT based on waypoint selected on the Parameters page.



# 10.4 How to Modify an Existing Route

## 10.4.1 Parameters

Main parameters for the route planning are:

- Latitude and longitude of the waypoint
- Channel limits to the waypoint
- Turning radius of the waypoint

## 10.4.2 How to change waypoint position

To change position of a waypoint you have following alternatives:

- Enter latitude and longitude on the WPT page in the Plan Route dialog box.
- Enter distance and direction for next waypoint.
- Drag and drop waypoint using the left button.

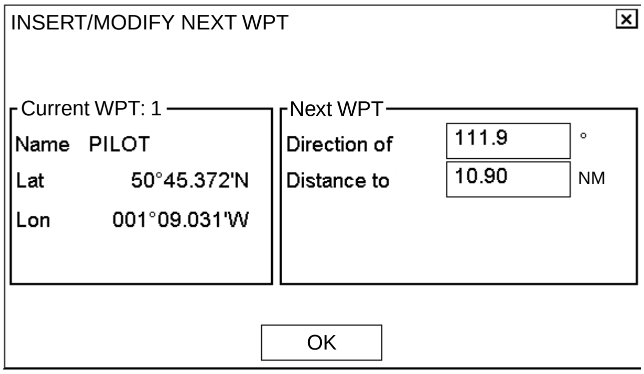
### *How to enter latitude and longitude in position field*

1. Put the cursor on Route in the sidebar, click the **Plan** button to open the Plan Route dialog box then click the WPT tab.
2. Check Enable changes, then choose desired WPT.
3. Put the cursor in the Lat or Lon field as appropriate, spin the scrollwheel to set co-ordinates then push the scrollwheel to confirm.

### *How to enter distance and direction for next waypoint*

Position of WPT can be defined using distance and direction between two waypoints.

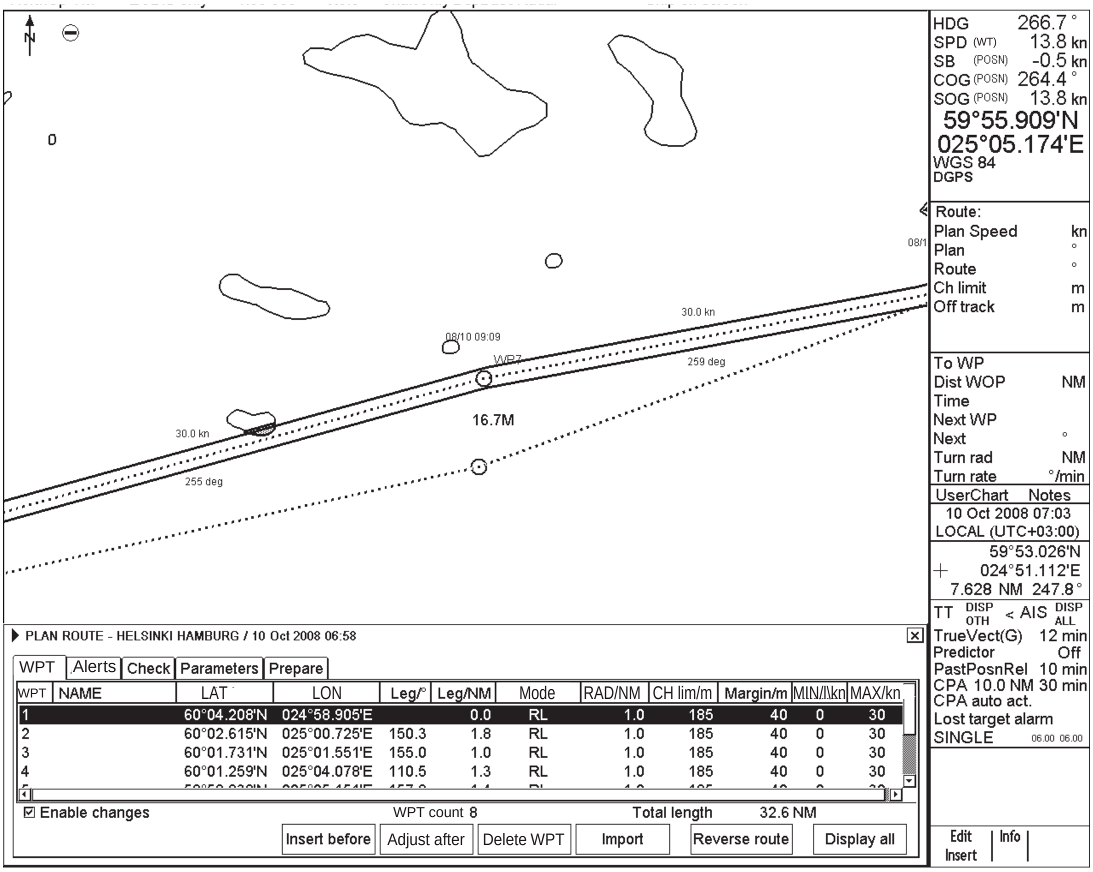
1. Put the cursor on Route in the sidebar, click Plan to open the Plan Route dialog box then click the WPT tab.
2. Check Enable changes, then highlight number of WPT by cursor then push the left button.
3. Click the **Next WPT** button, and the following dialog box appears.




4. Enter Direction and Distance in respective box in the Next WPT field then click the **OK** button.

### 10.4.3 How to drag and drop waypoint to new position

1. Put the cursor on Route in the sidebar, click Plan to open the Plan Route dialog box then click the WPT tab.
2. Check Enable changes, then put the cursor on the waypoint you want to process.
3. Press and hold down the left button while rolling the trackball to move the cursor to a desired position. Keep the button pressed down while you move the cursor and release it when the cursor is at desired position.




4. Drag and drop waypoint to new position (in this case waypoint number 9 is taken to a new position).

### 10.4.4 How to change other waypoint data

To change other data of a waypoint, such as name, steering mode, turning radius, min/max speed, do the following:

1. Put the cursor on a desired field and spin the scrollwheel to change data.
2. Push the scrollwheel to confirm changes.

### 10.4.5 How to add a new waypoint at the end of a route

There are two ways by which you can add a new waypoint at the end of a route:

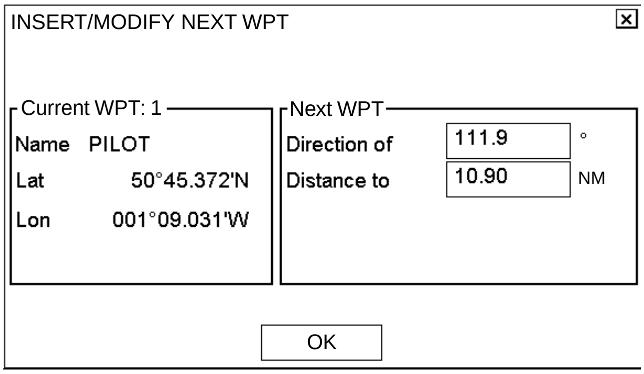
- Use the cursor and left button to define position of a waypoint.
- Use the **Insert after** button in the WPT page.

#### *To add a new waypoint by using the left button, do the following:*

1. Put the cursor on Route in the sidebar then click the **Plan** button to open the Plan Route dialog box. Click the WPT tab to open the WPT page. Check Enable changes.
2. Put the cursor in the electronic chart area on the location desired for a waypoint then push the left button. The waypoint is added at the end of route.
3. Modify data of added waypoint.

***To add a new waypoint by the Next WPT button, do the following:***

1. Put the cursor on Route in the sidebar then click the **Plan** button to open the Plan Route dialog box. Click the WPT tab to open the WPT page. Check Enable changes.
2. Choose last waypoint.
3. Click the **Adjust after** button in the Waypoints page. Enter direction and distance for waypoint then click the **OK** button.




## 10.4.6 How to insert a waypoint

If you want to insert a waypoint between two waypoints, use the **Insert before** button, on the WPT page. This inserts a waypoint next to current waypoint. For example, you want insert a new waypoint between waypoints 6 and 7. Choose WPT 7 then click the **Insert before** button. The new waypoint will be inserted between WPT 6 and WPT 7. WPT is highlighted on WPT list.

## 10.4.7 How to delete a waypoint

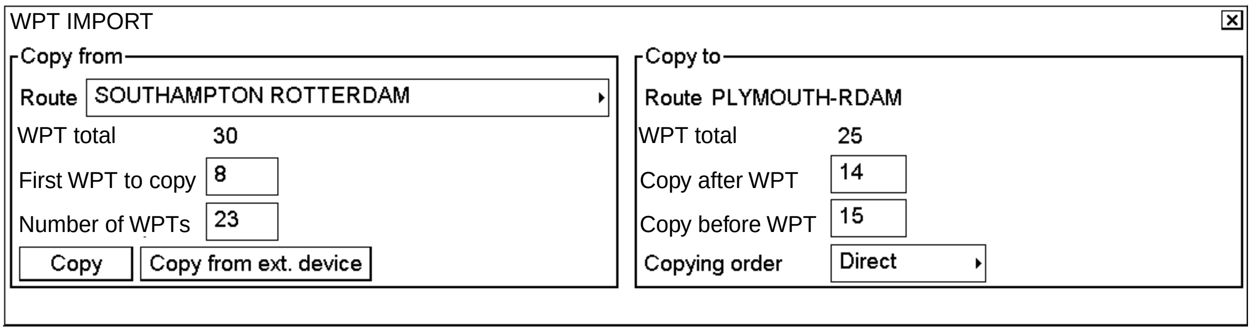
To delete a waypoint, do the following:

1. Put the cursor on Route in the sidebar then click the **Plan** button to open the Plan Route dialog box. Click the WPT tab to open the WPT page. Check Enable changes.
2. Highlight WPT number on WPT list that you wish to delete.
3. Click the **Delete WPT** button.

### 10.4.8 How to import waypoint from other routes

You are able to choose waypoints from other routes to import them to current route. To import waypoints do the following:

1. Put the cursor on Route in the sidebar then click Plan to open the Plan Route dialog box. Click the WPT tab to open the WPT page. Check Enable changes.
2. Click the **Import** button. The following dialog box appears.

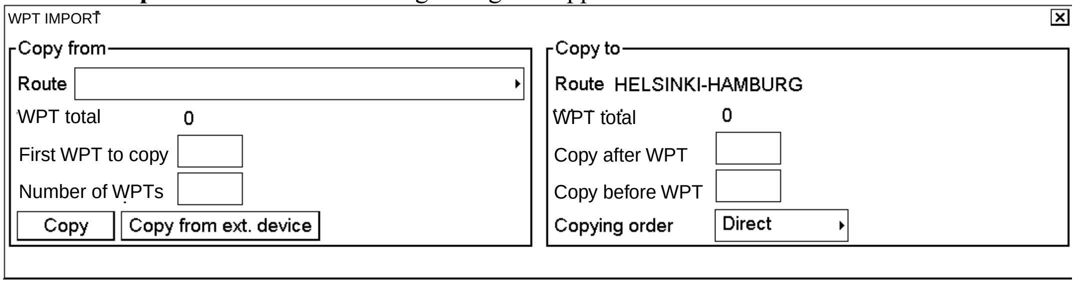



3. In the Copy from window, put the cursor in the Route box, spin the scrollwheel to choose the route from which to copy waypoints then push the scrollwheel.
4. Enter first waypoint to copy in "First WPT to copy". Spin the scrollwheel to choose WPT number then push the scrollwheel.
5. Enter number of waypoints to copy in "Number of WPTs". Spin the scrollwheel to choose desired number then push the scrollwheel.
6. Enter where to import waypoints. To enter them after a WPT in a route, enter waypoint number in the "Copy after WPT" box. If you want to enter them before a WPT in the route where WPTs will be imported, enter waypoint number in the "Copy before WPT" box.
   Spin the scrollwheel to choose desired number then push the scrollwheel.
7. Choose copying order, Direct or Reverse. "Direct" copies the waypoints in their original order; "Reverse" copies them in reverse order. Spin the scrollwheel to choose desired option then push the scrollwheel.
8. Click the **Copy** button.
9. When finished, click X at top right corner of the dialog box to close the dialog box.

### 10.4.9 How to import waypoint from external device

You are able to import waypoints from other External Device, like FURUNO GP-150 GPS Navigator to current route. To import waypoints do the following:

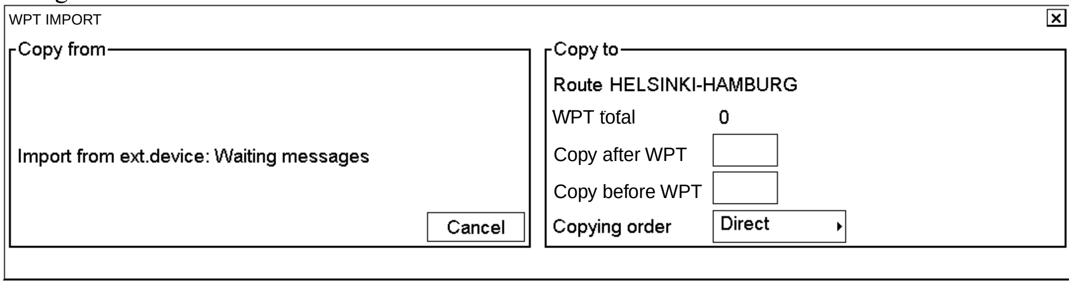
1. Put the cursor on Route in the sidebar then click Plan to open the Plan Route dialog box. Click the WPT tab to open the WPT page. Check Enable changes.
2. Click the **Import** button. The following dialog box appears.



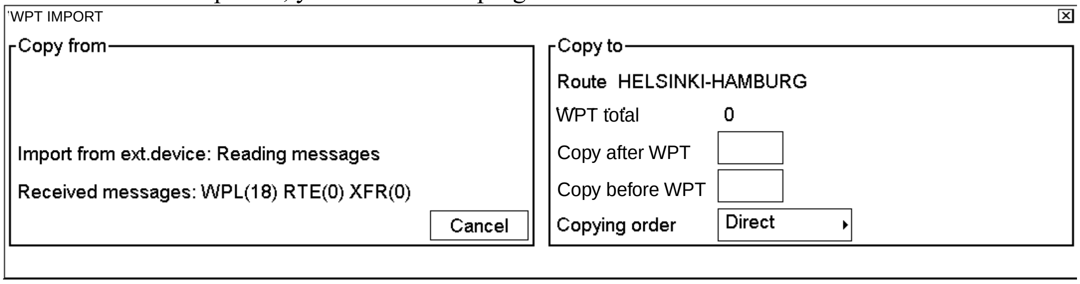

   Enter where to import waypoints. To enter them after a WPT in a route, enter waypoint number in the "Copy after WPT" box (if applicable). If you want to enter them before a WPT in the route where WPTs will be imported enter waypoint number in the "Copy before WPT" box.
   Spin the scrollwheel to choose desired number then push the scrollwheel.

3. Press the **Copy from ext. device** button.

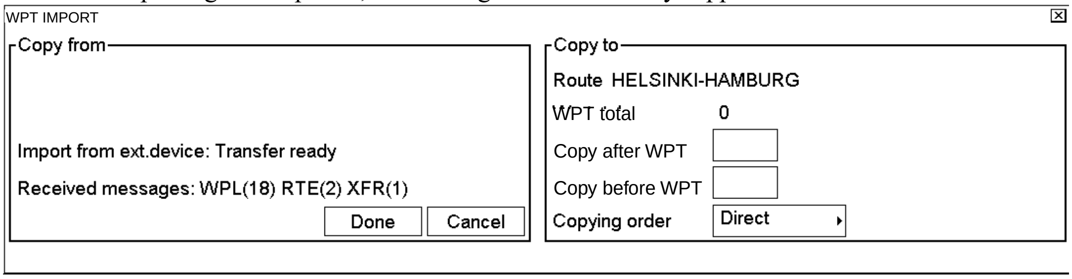
   When text "Import from ext. device: Waiting messages" appears, you can start importing WPTs from a GPS Navigator.




   When WPTs are imported, you can monitor progress of it as it is shown below.




   When the importing is completed, the message "Transfer ready" appears.




4. Click the **Done** button.
5. When finished, click X at top right corner of the dialog box to close the dialog box.

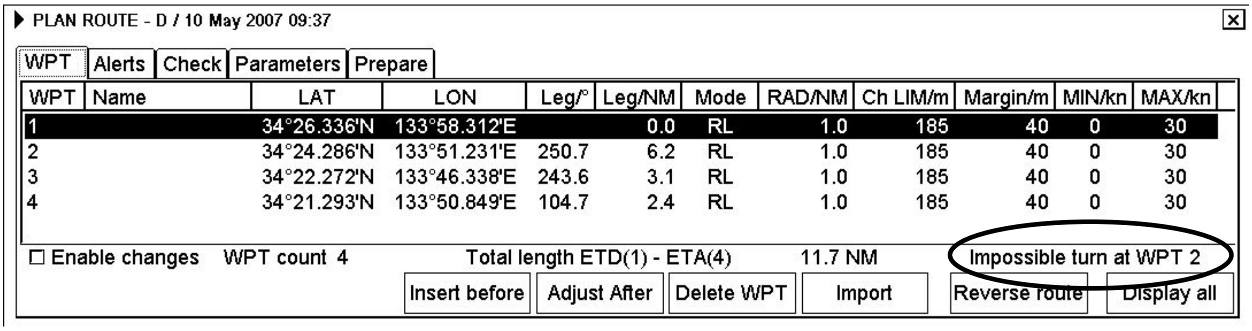
### 10.4.10 How to reverse sailing order of a route

You can reverse the order of waypoints in a plan route. Put the cursor on Route in the sidebar then click the **Plan** button to open the Plan Route dialog box. Click the WPT tab to open the WPT page. Check Enable changes. Click the **Reverse route** button.

### 10.4.11 Geometry check of route

When you add a new waypoint, modify a waypoint or change other waypoint data, the message "Impossible turn at WPT xx (waypoint no." may appear (in red). It means that the geometry of route makes it impossible for the ship to sail along a certain leg. Typically it is enough if you do the following, on the WPT page in the Plan Route dialog box.

1. Decrease the radius of turn of the waypoint or one of its neighbors.
2. Change lat/lon position of the waypoint or its neighbors.




## 10.5 Route Optimization

### 10.5.1 Available route optimization strategies

After all waypoints are inserted, the route is optimized from the Parameters page in the Plan Route dialog box. Optimization calculates all parameters for route steering (course and distance between two waypoints, maneuvering start point, WOP, etc.). There are four methods for optimization:

**Max Speed:**

This calculation uses the maximum speed defined in the ship parameters and multiplies by all reduction factors (weather, ice, fouling, etc.) together with speed limits given for each waypoint to generate ETA. ETA may be entered, however it is calculated with user-entered ETD and Speed limit. ETA and ETD are shown on the Monitor display.

**Time Table:**

Calculates the speed required in order to arrive at destination at required ETA. Maximum speed is never exceeded. The user enters ETD and ETA to calculate speed to use. * If, the user-entered ETA is earlier than that found with the Max. Speed calculation, the Max. speed -calculated ETA will be indicated below the Time Table ETA calculation figure.. The calculated speed is shown on the Monitor display as "Suggested **.*kn".

**Max. Profit:**

Based on ETD, this calculation takes in account the fuel cost and the fixed cost of the ship and calculates the most profitable speed (highest profit per time unit). You need to set Optimization parameters beforehand to use this feature. For further details, see section 19.1.4 Optimization parameters setting.

**Min. Cost:**

Based on ETD, this calculation takes in account the fuel cost and the fixed cost of the ship and calculates the speed that gives the minimum total cost. You need to set Optimization parameters beforehand to use this feature. For further details, see section 19.1.4 Optimization parameters setting.

.

### 10.5.2 Optimize a route

You can define Estimated Time of Departure (ETD), desired number of waypoints and Estimated Time of Arrival (ETA) on the Parameters page in the Plan Route dialog box to optimize your route.

1. Click the Parameters tab to open the Parameters page. Check Enable changes.
2. Choose desired optimization strategy from the Optimize field. Spin the scrollwheel to choose desired strategy then push the scrollwheel.
3. Enter speed limit, ETC/UTC, ETA/UTC (Max. speed not required) in respective boxes.

***In case of optimization by "max. speed"***

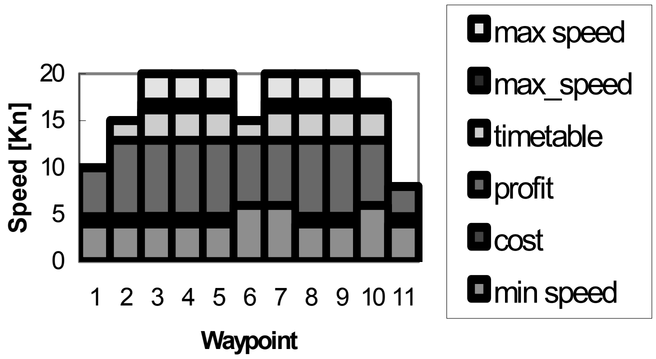
With entered EDT as reference, ETA is calculated with entered speed limit. ETA may be entered in ETA/UTC box, however ETA is shown below it.
The monitor display shows ETD, speed limit and calculated ETA.

### 10.5.3 How to plan a speed profile

A speed profile is defined by general max. speed and optimization types. These values are given while planning a route. You can define speed limit and optimize type in the Parameters page of the Plan Route dialog box and in the WPT page of the Plan Route dialog box you can give min. and max. speed for each leg. The table and illustration below demonstrate how different optimize types and speed limits influence speed.

| **max speed (general)** | | | | | | **17** |
|---|---|---|---|---|---|---|
| WPT | min speed | cost | profit | timetable | Max speed | max speed |
| 1 | 4 | 4.8 | 10.0 | 10.0 | 10 | 10 |
| 2 | 4 | 4.8 | 12.9 | 15.0 | 15 | 15 |
| 3 | 4 | 4.8 | 12.9 | 16.2 | 17 | 20 |
| 4 | 4 | 4.8 | 12.9 | 16.2 | 17 | 20 |
| 4 | 4 | 4.8 | 12.9 | 16.2 | 17 | 20 |
| 5 | 6 | 6.0 | 12.9 | 15.0 | 15 | 15 |
| 6 | 6 | 6.0 | 12.9 | 16.2 | 17 | 20 |
| 7 | 4 | 4.8 | 12.9 | 16.2 | 17 | 20 |
| 8 | 4 | 4.8 | 12.9 | 16.2 | 17 | 20 |
| 9 | 6 | 6.0 | 12.9 | 16.2 | 17 | 17 |
| 10 | 4 | 4.8 | 8.0 | 8.0 | 8 | 8 |

**An Example of speed profile**



# 10.6 Backup

### *How to back up routes to a floppy disk*

Routes can be saved to a floppy disk for backup, use by other planning stations or navigation stations. For details, see "How to back up a file to a floppy disk" in section 14.3.

### *How to restore a file from a floppy disk*

If you lose route planning data, you can easily restore it if you have backed it up with a floppy disk. Other planning stations and navigation stations may also use route planning data stored on a floppy disk. For further details, see "How to read a file from a floppy " in section 14.3.

# 10.7 WPT Table Report

This report is generated when you choose Report from the Plan Route menu. To display the report viewer, choose Route-Plan from the sidebar, put the cursor on the triangle in the Plan Route dialog box, choose Report then push the scrollwheel. To close the report viewer, click X in the right corner of the report viewer. The report may be printed by clicking the **Print Text** button.

WPT report consists information of:

- Position of waypoints

- Planned speeds

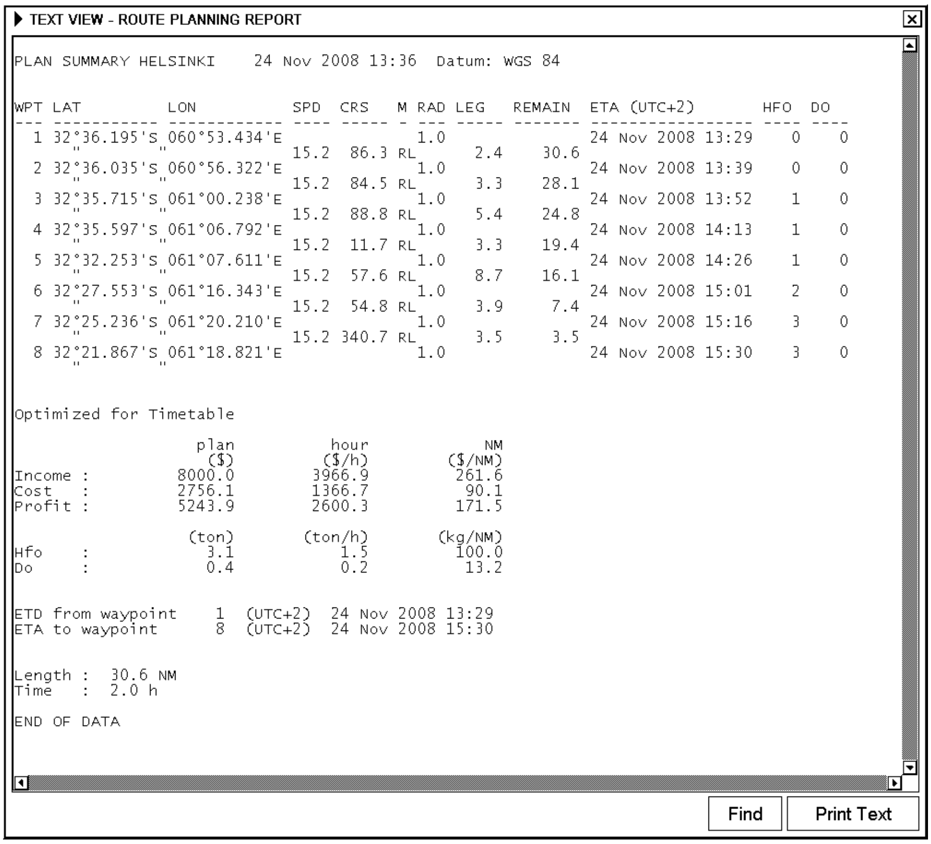
- Planned courses

- Distances between waypoints. Distance is not directly calculated from LAT and LON values of WPTs location, but the distance is shorter distance compensated for planned radius for each waypoint.

- Estimated times of arrival (ETA)

- Planned fuel consumption

-Total distance of route. Distance is not directly calculated from LAT and LON values of WPTs location, but the distance is shorter distance compensated for planned radius for each waypoint.


TEXT VIEW - ROUTE PLANNING REPORT

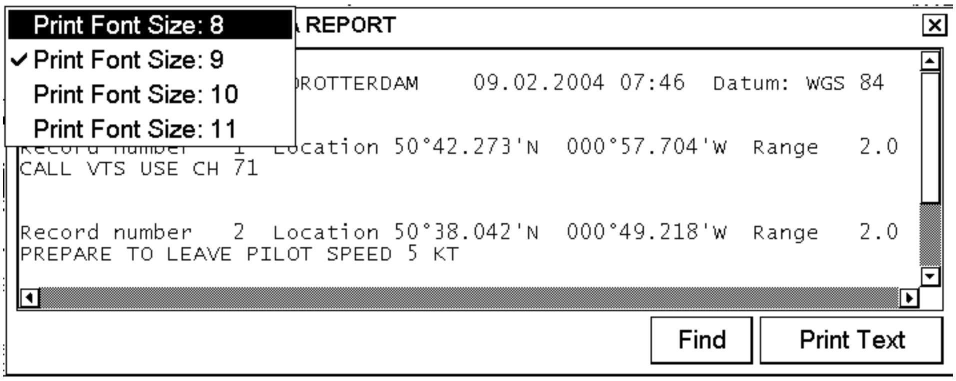
```
PLAN SUMMARY HELSINKI    24 Nov 2008 13:36  Datum: WGS 84

WPT LAT          LON           SPD  CRS   M RAD LEG   REMAIN  ETA (UTC+2)        HFO  DO
--- ----------- ------------ ---- ----- - --- ----- ------- ----------------- ---- ----
  1 32°36.195'S 060°53.434'E             1.0                24 Nov 2008 13:29    0    0
                             15.2  86.3 RL      2.4    30.6
  2 32°36.035'S 060°56.322'E             1.0                24 Nov 2008 13:39    0    0
                             15.2  84.5 RL      3.3    28.1
  3 32°35.715'S 061°00.238'E             1.0                24 Nov 2008 13:52    1    0
                             15.2  88.8 RL      5.4    24.8
  4 32°35.597'S 061°06.792'E             1.0                24 Nov 2008 14:13    1    0
                             15.2  11.7 RL      3.3    19.4
  5 32°32.253'S 061°07.611'E             1.0                24 Nov 2008 14:26    1    0
                             15.2  57.6 RL      8.7    16.1
  6 32°27.553'S 061°16.343'E             1.0                24 Nov 2008 15:01    2    0
                             15.2  54.8 RL      3.9     7.4
  7 32°25.236'S 061°20.210'E             1.0                24 Nov 2008 15:16    3    0
                             15.2 340.7 RL      3.5     3.5
  8 32°21.867'S 061°18.821'E             1.0                24 Nov 2008 15:30    3    0


Optimized for Timetable

                  plan         hour          NM
                   ($)        ($/h)       ($/NM)
Income :        8000.0       3966.9       261.6
Cost   :        2756.1       1366.7        90.1
Profit :        5243.9       2600.3       171.5

                 (ton)      (ton/h)      (kg/NM)
Hfo    :           3.1          1.5       100.0
Do     :           0.4          0.2        13.2

ETD from waypoint    1  (UTC+2)  24 Nov 2008 13:29
ETA to waypoint      8  (UTC+2)  24 Nov 2008 15:30

Length :  30.6 NM
Time   :  2.0 h

END OF DATA
```

Find | Print Text

### *How to change font used in report*

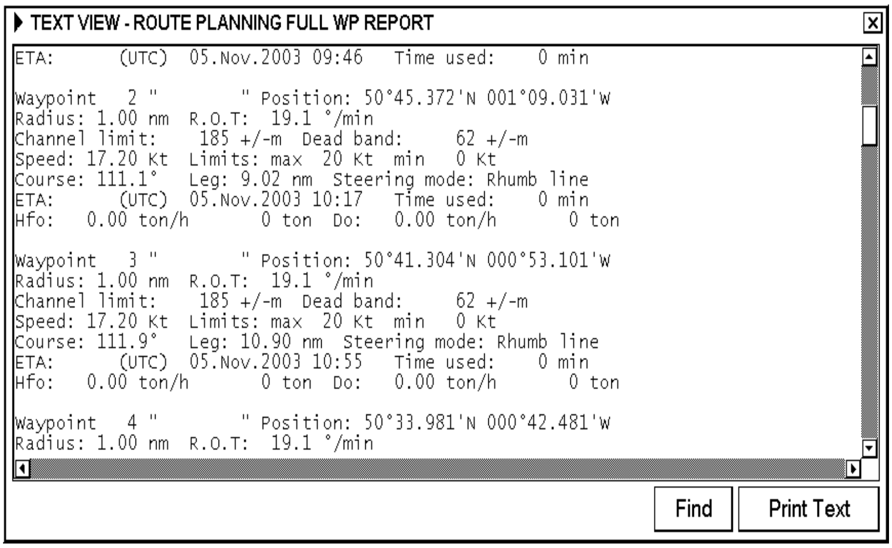
If you want to change the size of the font for the report:

1. Put the cursor on the triangle in the report window.
2. Choose desired option from the list then push the scrollwheel.




## 10.8 Full WPT Report

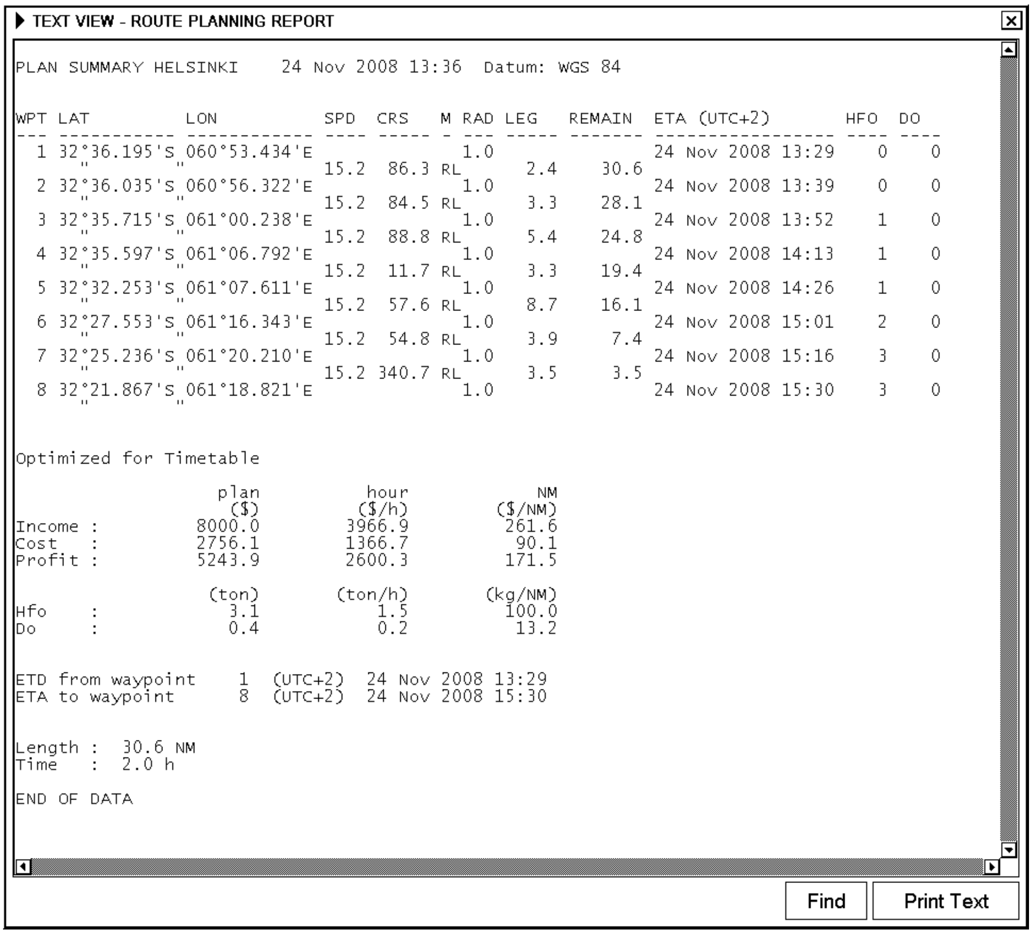
The Full WPT Report provides detailed information on each waypoint in a plan route. To display the report viewer, Put the cursor on the triangle in the Plan Route dialog box, choose Full WPT Report from the menu then push the scrollwheel. The report may be printed by clicking the **Print Text** button.



# 10.9 Passage Plan Report

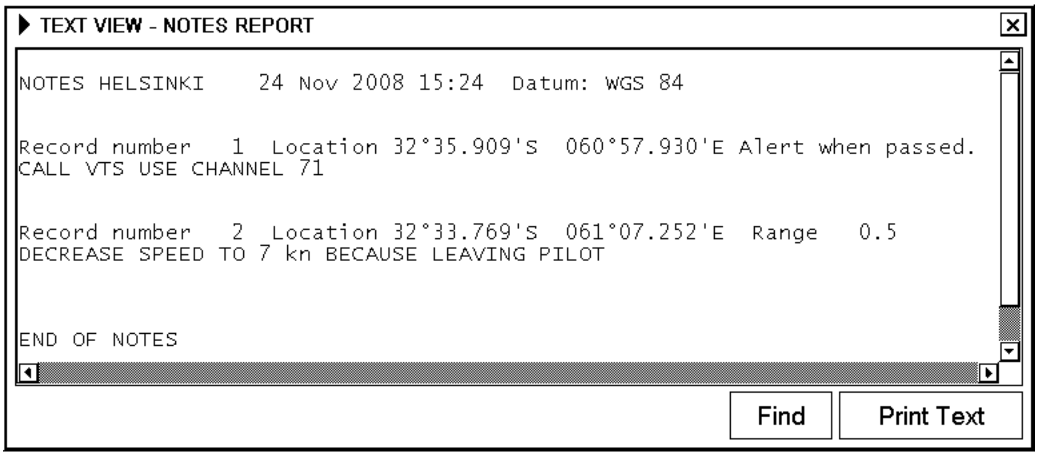
Passage Plan report generates WPT report together with Notes report. The system automatically attaches Notes from the plan mode on the route plan when you choose the Passage Plan report. To display the report viewer, choose Route-Plan from the sidebar, put the cursor on the triangle in the Plan Route dialog box, choose Passage Plan Report from the menu then push the scrollwheel. To close the report, click X in the right corner of the report viewer. The report may be printed by clicking the **Print Text** button.

The example below shows that a passage plan has been generated using the route plan "SOUTHAMPTON ROTTERDAM" and Notes generated for "SOUTHAMPTOROTTERDAM".



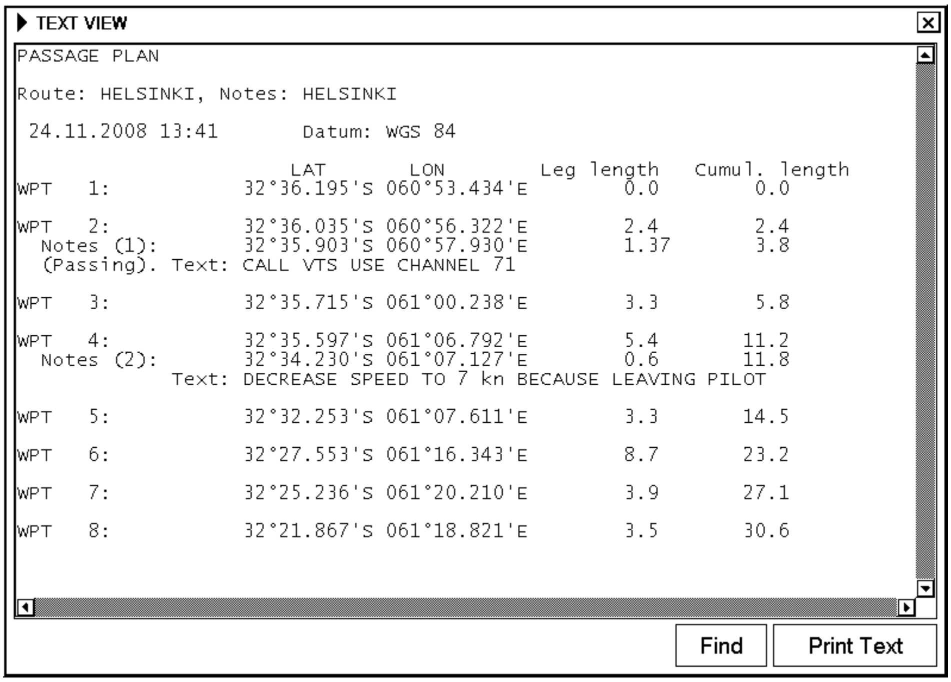
```
TEXT VIEW - ROUTE PLANNING REPORT

PLAN SUMMARY HELSINKI    24 Nov 2008 13:36  Datum: WGS 84

WPT LAT         LON          SPD  CRS   M RAD LEG   REMAIN  ETA (UTC+2)       HFO  DO
--- ----------- ------------ ---- ----- - --- ----- ------- ----------------- ---- ----
  1 32°36.195'S 060°53.434'E              1.0               24 Nov 2008 13:29    0    0
                             15.2  86.3 RL        2.4    30.6
  2 32°36.035'S 060°56.322'E              1.0               24 Nov 2008 13:39    0    0
                             15.2  84.5 RL        3.3    28.1
  3 32°35.715'S 061°00.238'E              1.0               24 Nov 2008 13:52    1    0
                             15.2  88.8 RL        5.4    24.8
  4 32°35.597'S 061°06.792'E              1.0               24 Nov 2008 14:13    1    0
                             15.2  11.7 RL        3.3    19.4
  5 32°32.253'S 061°07.611'E              1.0               24 Nov 2008 14:26    1    0
                             15.2  57.6 RL        8.7    16.1
  6 32°27.553'S 061°16.343'E              1.0               24 Nov 2008 15:01    2    0
                             15.2  54.8 RL        3.9     7.4
  7 32°25.236'S 061°20.210'E              1.0               24 Nov 2008 15:16    3    0
                             15.2 340.7 RL        3.5     3.5
  8 32°21.867'S 061°18.821'E              1.0               24 Nov 2008 15:30    3    0


Optimized for Timetable

                    plan         hour          NM
                    ($)          ($/h)         ($/NM)
Income :          8000.0       3966.9         261.6
Cost   :          2756.1       1366.7          90.1
Profit :          5243.9       2600.3         171.5

                   (ton)       (ton/h)        (kg/NM)
Hfo    :             3.1          1.5         100.0
Do     :             0.4          0.2          13.2

ETD from waypoint    1  (UTC+2)  24 Nov 2008 13:29
ETA to waypoint      8  (UTC+2)  24 Nov 2008 15:30

Length :  30.6 NM
Time   :  2.0 h

END OF DATA

Find    Print Text
```

*An example of WPT report*



```
TEXT VIEW - NOTES REPORT

NOTES HELSINKI    24 Nov 2008 15:24  Datum: WGS 84

Record number   1  Location 32°35.909'S  060°57.930'E Alert when passed.
CALL VTS USE CHANNEL 71

Record number   2  Location 32°33.769'S  061°07.252'E  Range   0.5
DECREASE SPEED TO 7 kn BECAUSE LEAVING PILOT

END OF NOTES

Find    Print Text
```

*An example of Notes report*




*An example of passage plan report. Notes text notes are placed between waypoints based on their position (in which leg defined Notes will be activated)*

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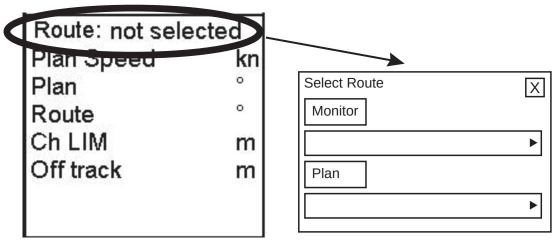
# 11. How to Monitor Routes

Route monitor is a means for permanent monitoring of the ship's behavior relative to the monitored route. The information area displays the data on the ship's position relative to the monitored route. The monitored route consists of the following information, displayed in the electronic chart area:

- The route is displayed with red dots.
- The limits of channels of each leg are displayed with solid red lines. These limits are used to detect chart alerts when you are monitoring the route. For further details, see section 9.1 Chart Alerts.
- Each leg has information about planned speed, shown inside a rectangle.
- Each leg has information about planned course to steer.

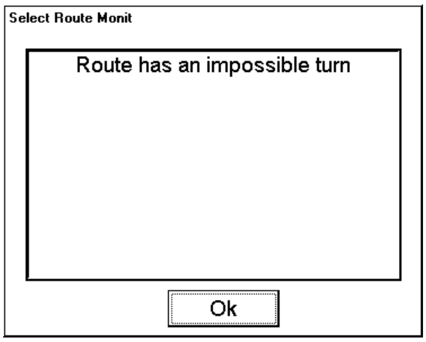
**Note:** In order to display charts with correctly updated situation, always use current date as Approve Until and Display Until during your voyage. If your voyage lasts more than one week, set current date at least once per week during your voyage. For more information, see section 7.11 Chart Viewing Dates and Seasonal Features of the Vector Chart.

## 11.1 How to Select Route to Monitor




To choose the route to monitor, put the cursor on Route in the sidebar, put the cursor in the Monitor combo box, spin the scrollwheel to choose route then push the scrollwheel.

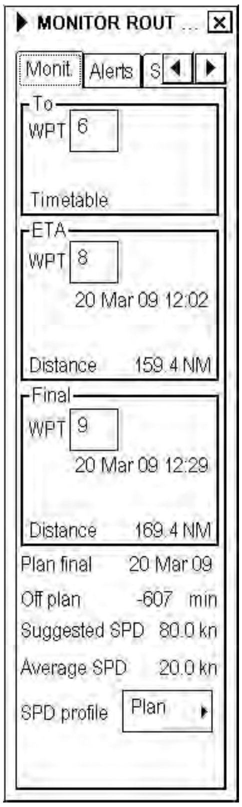
**Note:** When you choose a route for monitoring, the message shown below may appear when the geometry of the route makes it impossible to sail the ship. Choose the Plan Route dialog box and make necessary modifications.



## 11.2 How to Select TO Waypoint

When the connected Radar is FURUNO or Radar that communicates using IEC 61162-1 standard the monitor dialog box looks like the figure at right. Note that there is no control for visibility of monitored route in this dialog box.

To display this dialog box, choose Route from the sidebar, then click the **Monitor** button.




When you have chosen a route to monitor, the system chooses a next waypoint automatically. Check that the TO waypoint is the desired one. The chart radar will automatically advance to a next waypoint when you pass the TO waypoint.

The chart radar automatically sets the last waypoint of your monitored route as the final waypoint.

To choose TO waypoint, do the following:

1. Open the Monitor Route dialog box, choose Route from the sidebar, then click the **Monitor** button.
2. Put the cursor in the TO WPT box, then spin the scrollwheel to choose desired WPT.
3. Push the scrollwheel to confirm your selection.

## 11.3 How to Select Final Waypoint

Normally you use the last waypoint in a monitored route as the final waypoint, and the chart radar automatically does this when you choose the route to monitor. However, sometimes you can prefer to use some other waypoint as the final waypoint of a monitored route.

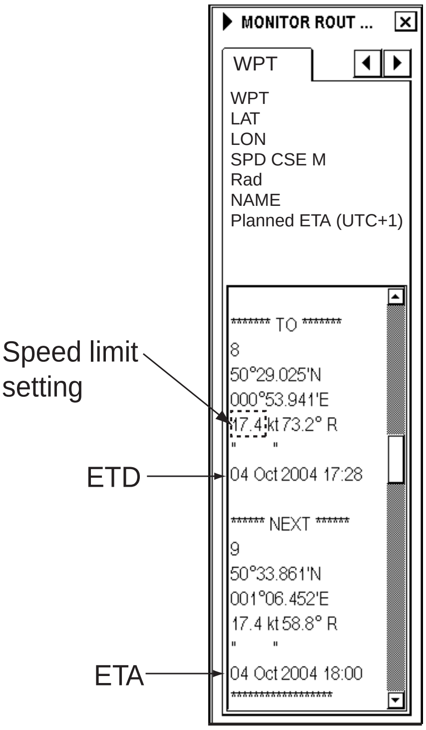
To choose a waypoint as final waypoint, do the following:

1. Open the Monitor Route dialog box; choose Route from the sidebar, then click the **Monitor** button.
2. Put the cursor in the Final WPT box, spin the scrollwheel to choose a waypoint.
3. Push the scrollwheel to confirm your selection.

## 11.4 How to View Waypoint Information

You can view waypoint information for the monitored route by clicking the Waypoints tab in the Monitor Route dialog box. This information is printed from route planning information made for this voyage.

"TO WPT" and "NEXT WPT" are indicated on this list.



## 11.5 How to Display a Route on the ECDIS Screen

To display a monitored route, make sure that desired options of the monitored route (center line, channel borders, leg marks and wheel over line) are chosen on the Route page of the Symbol Display dialog box.

To show this display, spin the scrollwheel to show Symbol Display/Info/ in the mouse functions area, push the left mouse button then click an arrow tab to display the Route menu.

- **WPT mark** enables display of a waypoint's number in a route.
- **Leg marks** enables display of planned speed and planned course to steer in a route.
- **Wheel over line** enables display of a line that denotes turn start line for a waypoint. This line appears when "WPT approach" is coming and disappears when turning has started.

Do not set the following combinations of Center line, Channel limit and Safety margin:

| Center lines | Channel limit | Safety margin |
|---|---|---|
| Off | Off | Off |
| Off | On | On |
| On | On | On |

## 11.6 Route Assistant

The system has a built-in route assistant that facilitates safe use of routes. During route planning, you can check your route plan for safe water and you can attach a user chart and Notes that you intend to use together with a route plan.

The assistant reminds you if

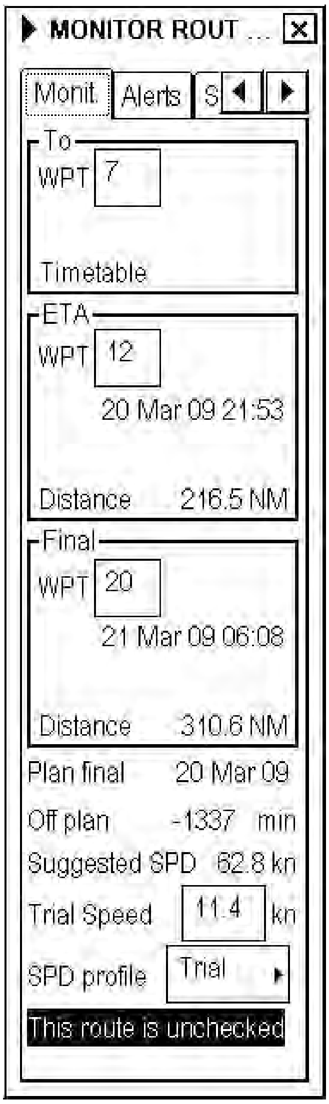
- You are using a route that you have not checked following recent change to your route plan.
- You use a combination of a route plan, user chart and Notes that you did not plan to be used together.

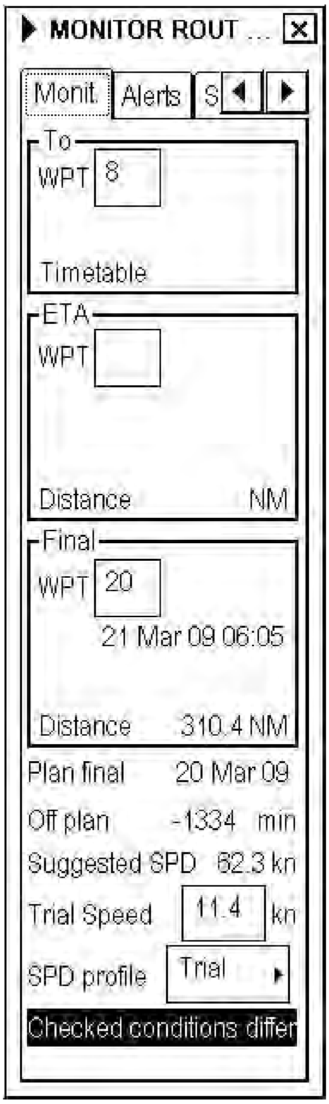
If the conditions defined during route plan do not meet the conditions during route monitoring, Mon. Route appears in red on the sidebar.

The following indications may appear on the Monitoring page:

**"This route is unchecked".** Reminds you that you did not check the route plan after the route was modified. **Remedy:** check route plan for the route.

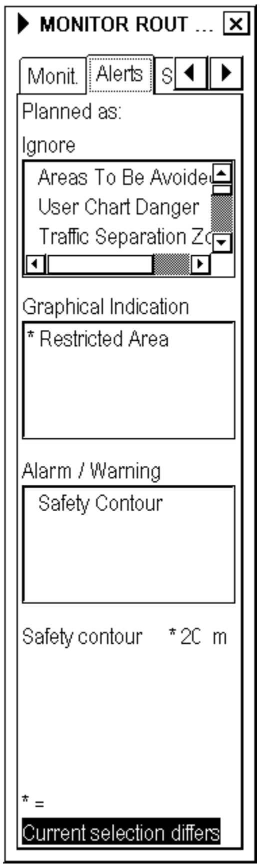
"**Checked conditions differ**" means that current conditions differ from set conditions of route plan. **Remedy:** Use Alerts and Selections pages to set them as they were when route was planned.



The Alerts page may show the following message:

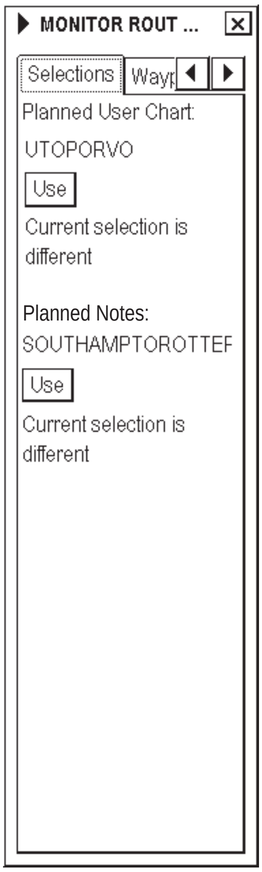
"* = **Current selection differs**" indicates which conditions are currently set differently as planned.
Remedy: Open Chart Alert parameters to set them as they were at the time the route was planned.

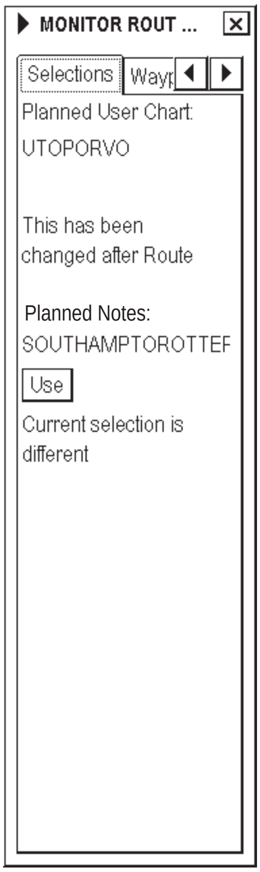



The Selection page may show the following messages:

"**Current selection is different**" This means the name of user chart and/or Notes in the monitor mode is not the same as route planning check. **Remedy:** Click the **Use** button to choose user chart and/or Notes in the monitor mode.

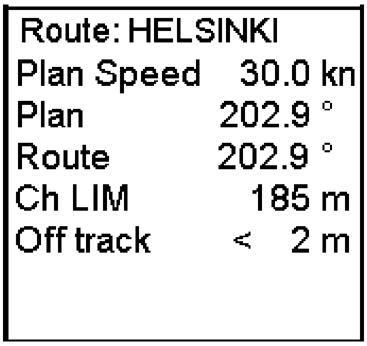
"**This has been changed after Route Planning Check**" This means that user chart and/or Notes was modified after the latest route planning check. **Remedy:** Check route planning for the route with attached user chart and/or Notes.



## 11.7 How to Monitor a Route

You can monitor the route from the two Plan Speed windows in the information area.



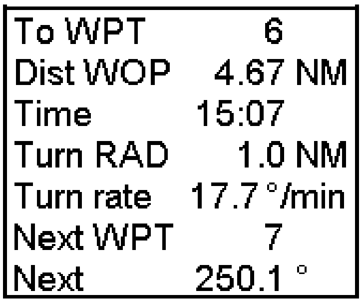

**Upper window**

- **Plan Speed:** Planned speed to approach "To WPT".
- **Plan:** Planned course between previous WPT and "To WPT". Note that if the gyro value is compensated and Gyro error correction and Gyro error compensation have been enabled in Ship and Route parameters in the Initial Settings menu, then the text "(corr)" appears (in red) in the Plan field.
- **Route:** Calculated set course to follow the monitored route, including off track, drift and gyro error compensation.
- **Ch LIM:** Planned width of channel to approach "To WPT".
- **Off track:** Perpendicular distance of the ship from the track.

*Below is an example with additional text information*

Permanent alerts are available regardless of the steering mode used and these are as follows:

- "Outside channel" is indicated by showing "Off track" in orange and its value in red.




**Lower window**

- **To WPT:** The waypoint that the ship is approaching.
- **Dist WOP:** Distance to the point where rudder order for course change at "To WPT" will be given.
- **Time:** Time remaining until WOP (dd:hh:mm:ss).
- **Next WPT:** The WPT following the "To WPT".
- **Next:** Planned course to steer after "To WPT". Note that if the gyro value is compensated and Gyro error correction and Gyro error compensation have been enabled in the Ship and Route parameters in the Initial Settings menu, then the text "(corr)" appears (in red) in the Plan field.
- **Turn RAD:** Planned turning radius at "To WPT".
- **Turn rate:** Calculated rate of turn, which is based on current speed and planned turning radius.

# 11.8 ETA (Estimated Time Of Arrival)

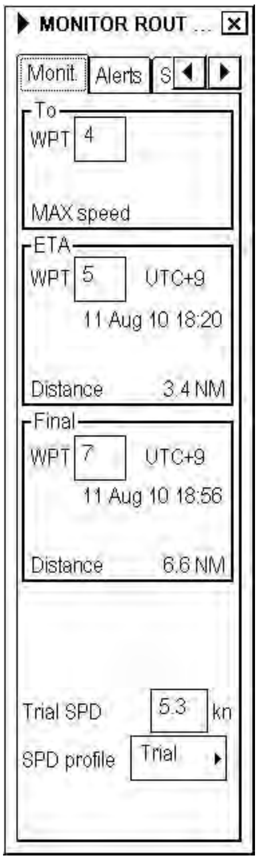
The chart radar calculates estimated time of arrival to a waypoint. The user can choose waypoint number and speed profile for calculation in the Monitoring page of the Monitor Route dialog box.

**To WPT:** Indicates approaching "TO WPT".

**ETA WPT:** Indicates waypoint number of special ETA waypoint and estimated time and distance to it.

**Final WPT:** Indicates waypoint number of final waypoint and estimated time and distance to it.

Monitored route is optimized using "Max Speed".



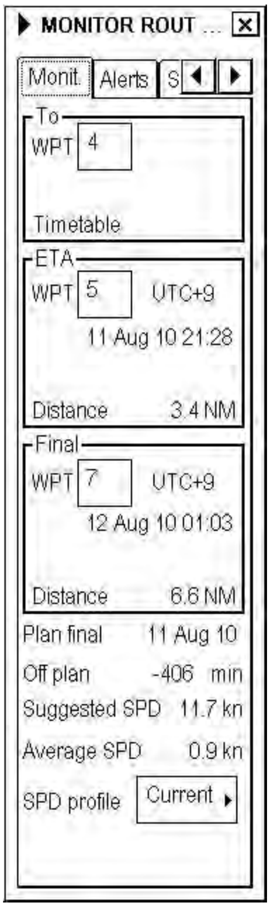

**Speed profile:**

There are three calculation strategies:

- **Plan:** The system calculates with optimization made in route planning.
- **Trial:** You can enter speed to test ETAs with different speeds.
- **Current:** The system calculates ETAs using average speed of last five minutes. Note that if Speed profile is chosen as Current, own ship average speed (i.e., speed for calculation) the Trial speed box replaces the Average Speed box and trial speed is shown in that box.

.

Time table optimization displayed in route monitoring




**Plan final:**

This displays ETA at final WPT. This value also appears in the Parameters page of the Plan Route dialog box.

**Off Plan:**

Indicates time difference between planned ETA and calculated ETA to final WPT.

**Suggested SPD:**

The system calculates suggested speed so that ETA to the final WPT would be same as planned ETA if type of optimization was "Time table".

The table below shows how the system calculates ETAs.

| **Type of chosen speed profile / optimization on Route Monitor dialog box** | **Used speed from current point to the To WPT** | **Used speed from the To WPT to the final WPT** |
|---|---|---|
| Speed profile: Plan MAX SPEED | current average speed | planned leg speed |
| Speed profile: Plan TIMETABLE | current average speed | planned leg speed |
| Speed profile: Plan ECO: COST | current average speed | planned leg speed |
| Speed profile: Plan ECO: PROFIT | current average speed | planned leg speed |
| Speed profile: Trial | current trial speed | current trial speed |
| Speed profile: Current | current average speed | current average speed |

# 11.9 Route Monitoring Alerts

The following alerts are related to route monitoring.

**352 Route: Illegal ETA WPT:** Appears when the system cannot use the chosen ETA waypoint. The reason might be corrupted or missing route file.

**353 Route: Illegal To WPT:** Appears when the system cannot use the chosen "To WPT". The reason might be corrupted or missing route file.

**354 Route: Illegal final WPT:** Appears when the system cannot use the chosen final waypoint. The reason might be corrupted or missing route file.

**360 Route: WPT change disabled:** Appears when you try to change next or final waypoint while the system is in automatic route steering. Leave automatic route steering and change the waypoint.

**363 Route: Choose disabled:** Appears when the you try to choose a new route for route monitoring while the system is in automatic route steering. Leave automatic route steering and choose a new route.

**364 Route: Cancel disabled:** Appears when you try to cancel current monitored route while the system is in automatic route steering. Leave automatic route steering and cancel the current route.

**454 Route: End reached:** Appears when own ship passes the last waypoint. The system cancels current route monitoring. Normally this alert only appears if alert 458 is left unacknowledged.

**457 Route: Outside chl limits:** Appears if own ship is outside the monitored channel.

The following alerts are related to route monitoring when automatic route steering is not used:

**451 Route: WPT approach alert:** Appears when own ship is "x" minutes of the wheel over point of the next waypoint, "x" being the time specified.

**458 Route: Last WPT approach:** Appears when own ship arrives "x" minutes from the last waypoint, "x" being the time specified. Acknowledgement of this alert cancels current route monitoring.

# 12. User Chart Control

## 12.1 Introduction

User charts are simple overlay charts that the user makes for his or her own purposes. They can be displayed on both the radar display and the electronic chart. These charts are intended for highlighting safety-related items like position of important navigation marks, safe area for the ship, etc. User charts areas can be used to activate alerts and indications based on user-defined danger symbols, lines and areas. When route or own ship estimated position is going to cross a user chart symbol, line or area that is defined as a dangerous one, an alert or indication is generated by the system. For further details about chart alerts, see Chapter 9 Chart Alerts.

A user chart consists of points, lines and letter/number, symbols, etc. Size of user chart is limited to have the max. number of items below:

- 200 Points
- 2000 Lines
- 1000 Symbols (alphanumerics)
- 50 Areas; an area can have 20 corner points.

The user chart is displayed on the radar display and its position and shape is based on the ship's actual position. When own ship is moving in the area covered by the user chart, the elements of the user chart are superimposed on the radar, with max. 80 nearest elements displayed. The user charts can also be shown on the chart radar display. In this way the radar display can be kept as "clean" as possible for radar target detection.

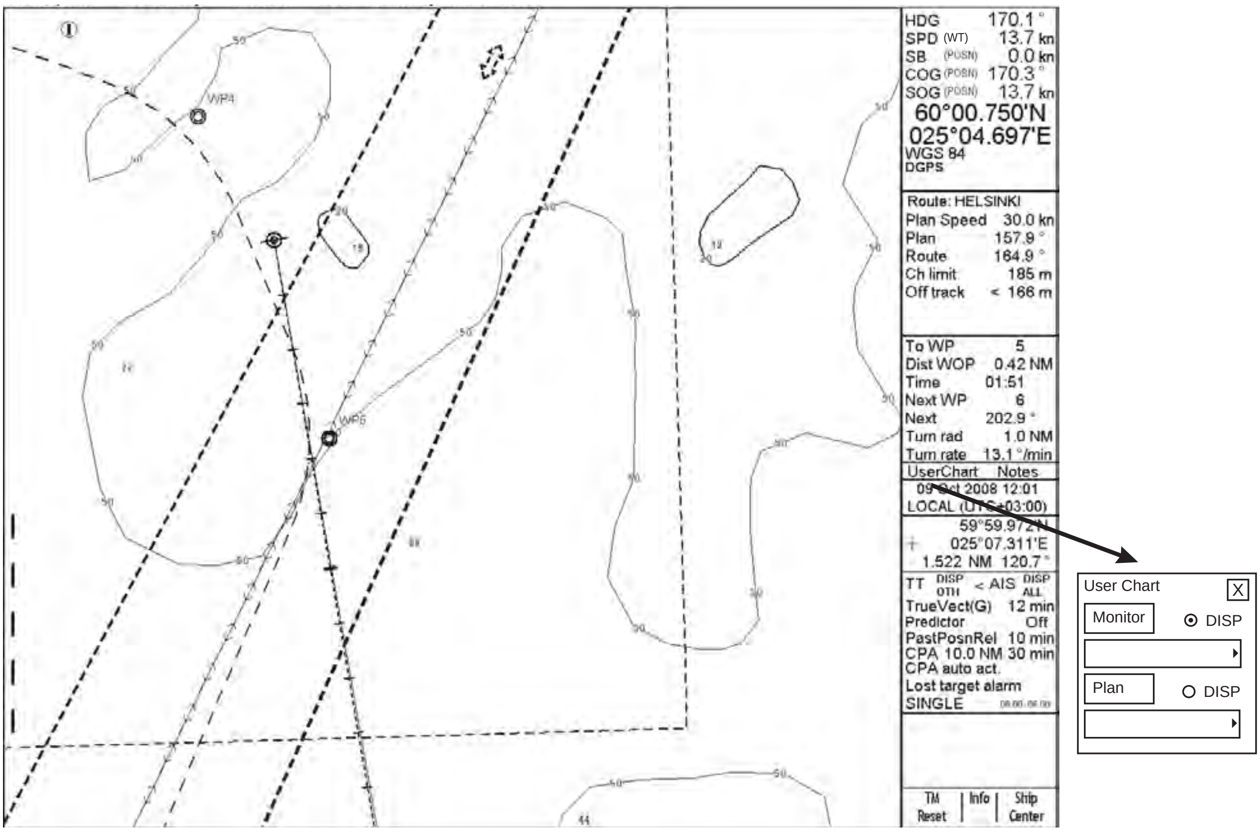
### 12.1.1 Objects of user charts

Below is a description of the objects used in a user chart.

- **Line:** You can define four different types of lines. Lines can be used in chart alert calculation and/or display on the radar:
    - **Navigation lines:** Displayed on both displays (radar + chart radar). Navigation lines are reference lines for coast line.
    - **Coast line:** Displayed on the chart radar display only. Coastal line is usually a well-defined (by chart digitizer) multi-segment line showing the coastline. The user is able to create this type of line in case there is no suitable chart available over desired area in S57 format.
    - **Depth contour:** Displayed on the chart radar display only. Depth line shows the chosen depth levels. The user is able to create this type of line in case there is no suitable chart available over desired area in or S57 format.
    - **Route line:** Displayed on both radar and chart radar. Route lines are zones for anchoring, traffic separation lines, etc.
- **Area:** User can define closed areas, which the system can use to detect safe water areas. If route or estimated ship position is going to cross the area, the system generates a warning to the user. These areas can be used to specify safe areas as defined by the master or by the policy of the ship's owner. They are always available regardless of the type of chart material used.
- **Symbols:** User-selectable symbols can be displayed on both chart radar and ECDIS display or on the chart radar display only. Symbols are used to indicate buoys, light houses, fixed targets, wrecks, etc. Symbols can be used in chart alert calculation.
- **Tidals:** Displayed on the chart radar display only. Tidals can be used to make own notes about tides at user-defined points.
- **Points:** It doesn't itself have any symbol on the radar screen, but it is a very important element of a user chart For further details, see section 12.2 What is a User Chart Point and how is it Used?.

### 12.1.2 Modes of user charts

A user chart can be chosen for the monitor mode, which means that it is displayed on connected Radar display and it can be used in chart alert calculation. Another user chart mode modifies the user chart plan mode. In the plan mode, a user chart is only displayed on the chart radar display; it is not displayed on the connected Radar nor is it used in chart alert calculation. It is possible to have both the monitored and planned user chart at the same time if separate plan and monitor units are used. Eventually the monitored and planned user charts copy the operation of monitored and planned routes. Below is an example how to know which user chart is used for monitor mode and which one is used in plan mode.

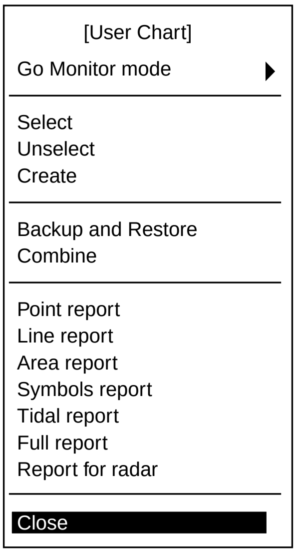


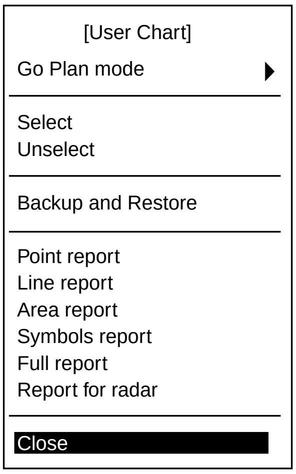

*The User Chart field in the information area where the user chart can be chosen for the monitoring or plan mode*

### *How to open the user chart dialog box and menu*

- Put the cursor on UserChart in the sidebar. Click either **Plan** or **Monitor** button to open corresponding dialog box. If no user chart has been chosen, one of the menus shown below appears, along with appropriate dialog box.
- Use the menu to choose user chart.

If you want to make further selection from a menu and only the dialog box is shown, you can show the menu on the display by clicking the **Plan** or **Monitor** button again, or put the cursor on the triangle in the dialog box.




**Go Monitor(or Plan) mode:** The user can switch user chart mode between plan and monitor modes with Go Monitor(Plan) mode on the menu. Push the scrollwheel to show the sub menu shown below.

- **Go Monitor mode>Go Monitor mode:** Switch from plan mode to monitor mode.
- **Go Monitor mode>Move Mon. to Plan mode:** Switch user chart currently used in plan mode to monitor mode.
- **Go Plan mode>Go Plan mode:** Switch from monitor mode to plan mode..
- **Go Plan mode>Move Plan to Mon. mode:** Switch user chart currently used in monitor mode to plan mode.

**Select:** User can specify user chart to use.

**Unselect:** Remove current user chart from active use.

**Create:** User can create a new user chart.

**Backup and Restore:** User can make backup copy of user chart or restore user chart from backup device.

**Combine:** User can combine two or more user charts together.

**Point report:**

Generates report about points in a user chart.

**Line report:**

Generates report about lines in a user chart.

**Area report:**

Generates report about area objects in a user chart.

**Symbols report:**

Generates report about symbols in a user chart.

**Tidal report:**

Generates report about tides in a user chart.

**Full report:**

Generates report about all the objects in a user chart.

**Report for radar:**

Generates report about all the objects in a user chart that is displayed on the radar screen.

## 12.2 What is a User Chart Point and how is it Used?

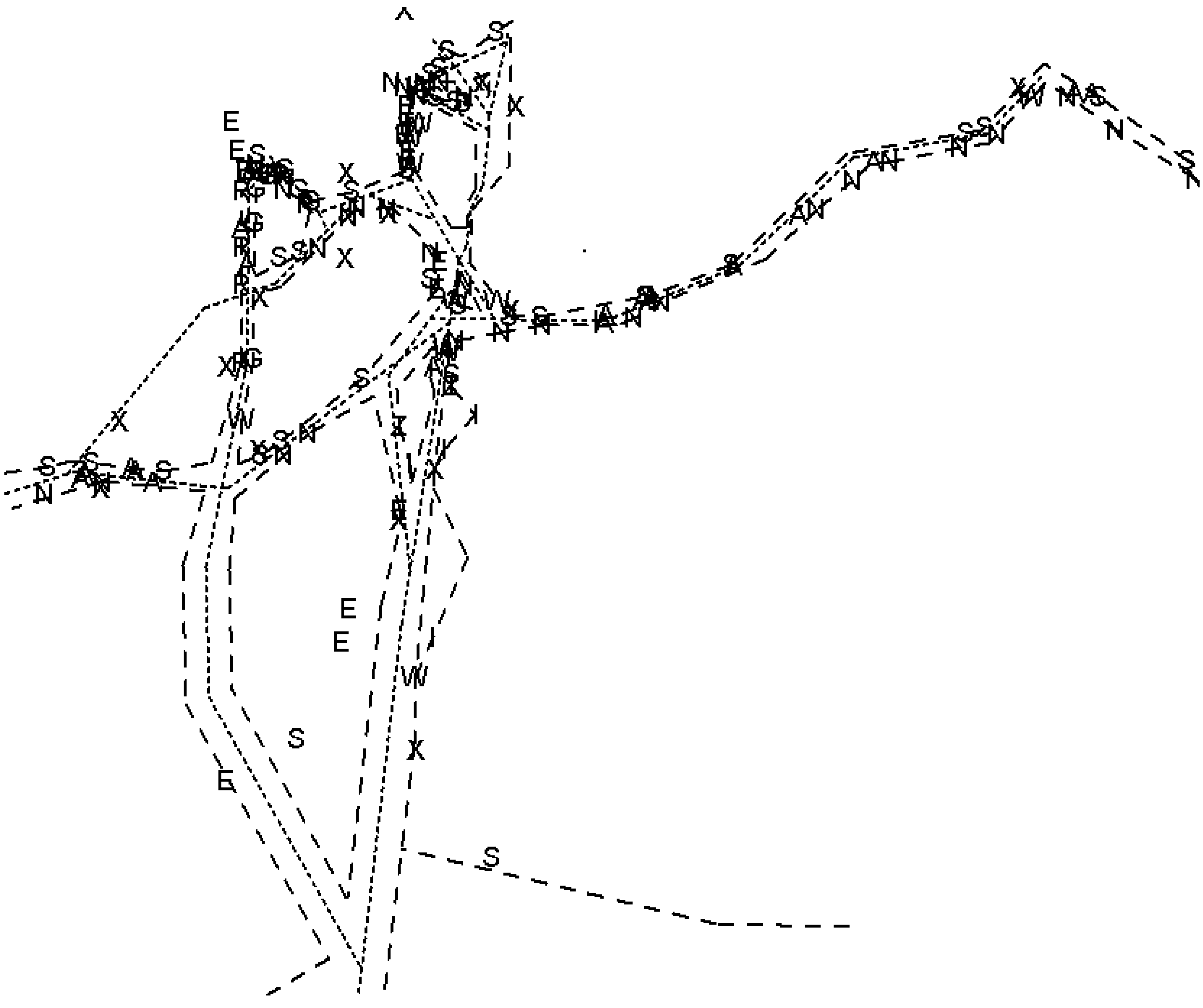
A point is a center point for a sub chart inside a user chart. Sub charts are small enough (max 80 elements) to be sent for display on the radar. Sub charts are made with post processing, which is performed automatically, when you leave editing (i.e., you uncheck Enable changes), you close the user chart window with the **CANCEL** button on the keyboard-equipped control unit or you choose a user chart from the menu.

The system doesn't require any points if the amount of lines intended for the Radar display is less than 60 and if the amount of symbols intended for the Radar display is less than 20. Note than lines are counted both from lines and area objects.

If the user chart has more than 60 lines or 20 symbols and if the user chart does not contain any points, the system will generate the alert "381 UserChart: Need Points" when you choose that user chart for use. It reminds you that only a part of your lines will be visible on the connected Radar, if you don't define points.

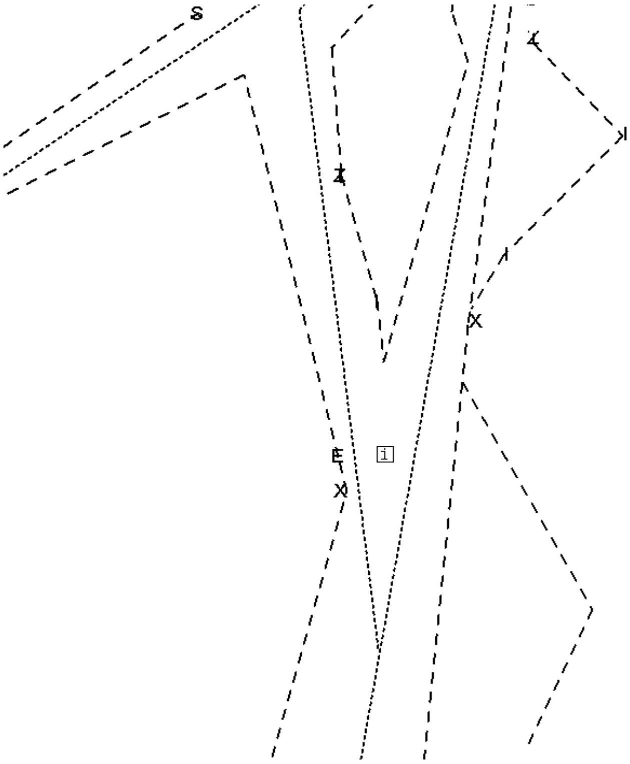
The symbol used for points is box with "i" inside:

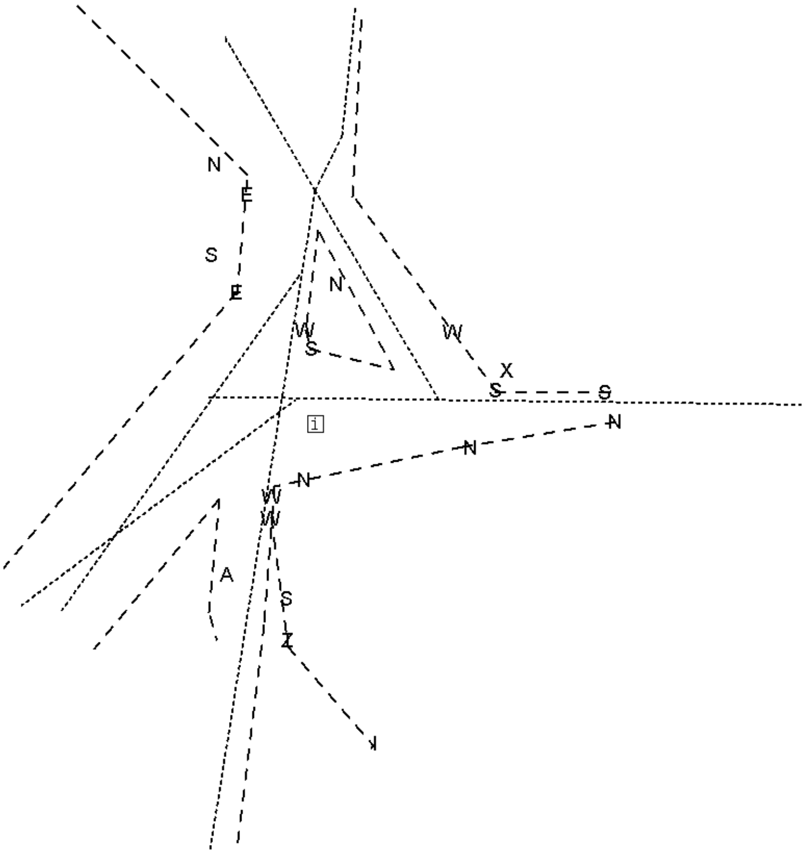
..



This is an example of a complex user chart with several hundreds of lines and symbols. The Radar can display max. 60 lines and 20 symbols from the complete user chart. Points are used to create sub-charts for Radar use. Each point can collect 60 nearest lines and 20 nearest symbols in a sub chart.

Below are some examples of sub-charts. Note the position used for points to collect the sub charts.



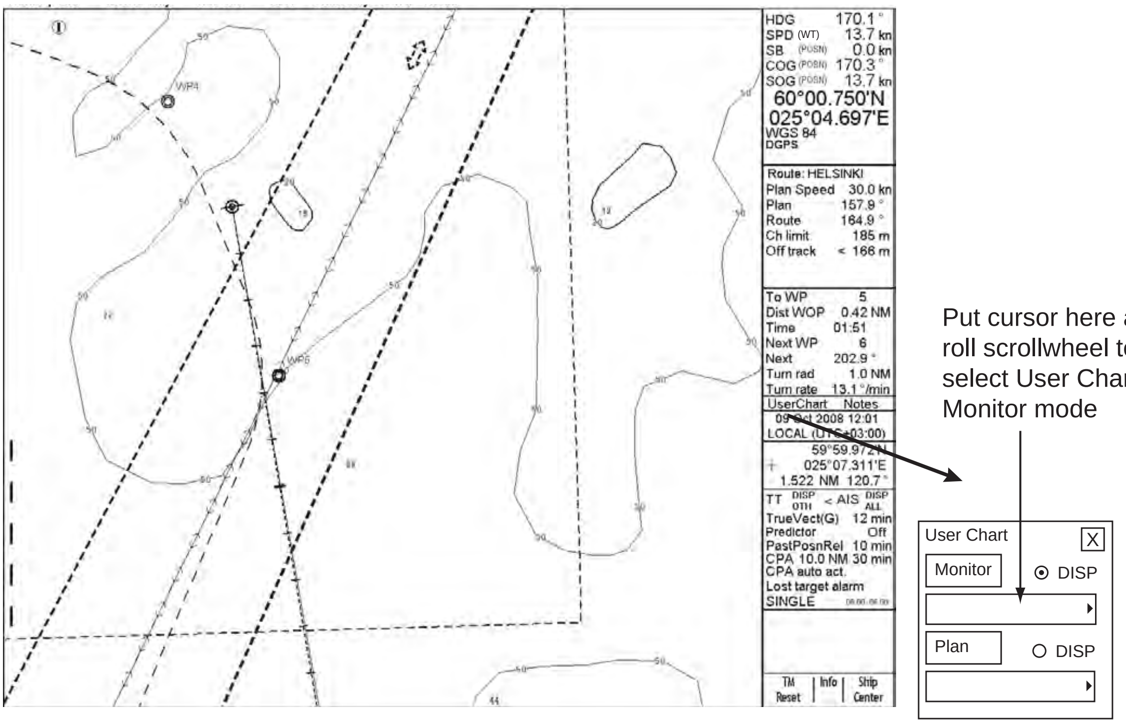


## 12.3 How to Select Datum

Selection of datum is very important, especially if you manually enter latitude-longitude positions from the control panel or keyboard or if you use digitizer. If you only use the cursor to add and to modify waypoint locations, then you could use any datum, although it is recommended to use native datum of the chart.

## 12.4 How to Select User Chart to use in Monitor Mode

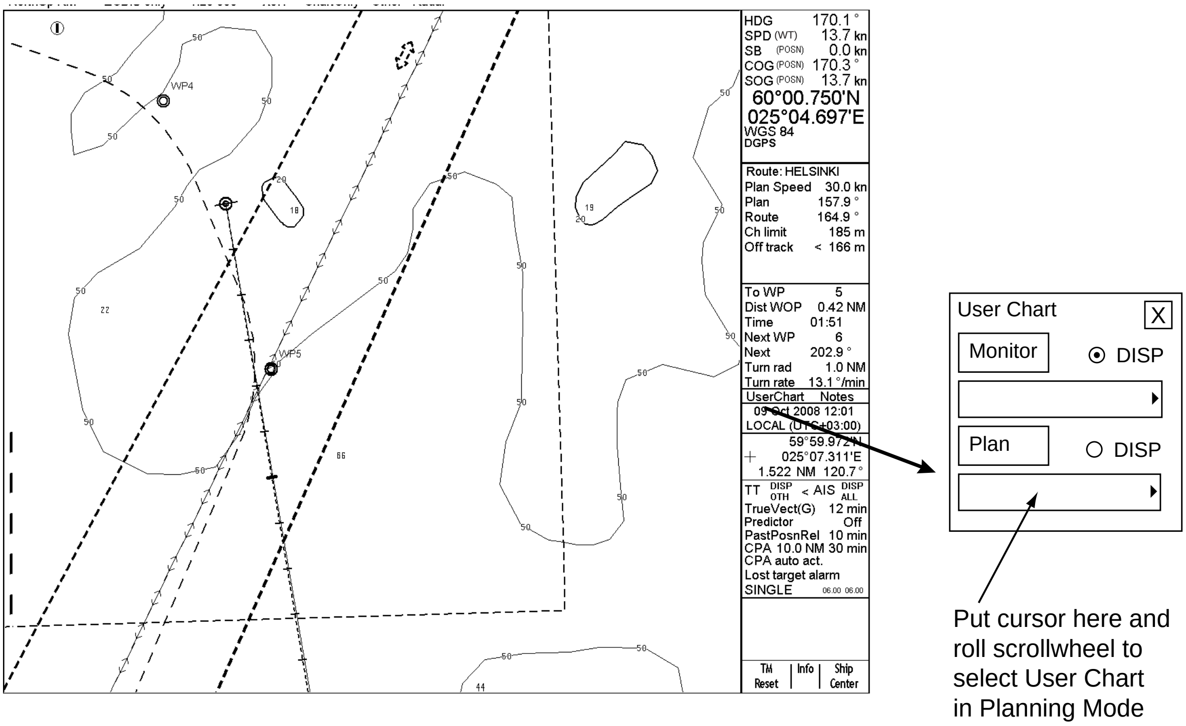
The user chart that is chosen for the monitor mode is indicated next to UserChart in the sidebar. If "UChart" is red this means that the workstation is currently displaying the user chart for the plan mode. To activate the monitor mode and choose a user chart for the monitor mode, do the following:



## 12.5 How to Select User Chart to use in Plan Mode

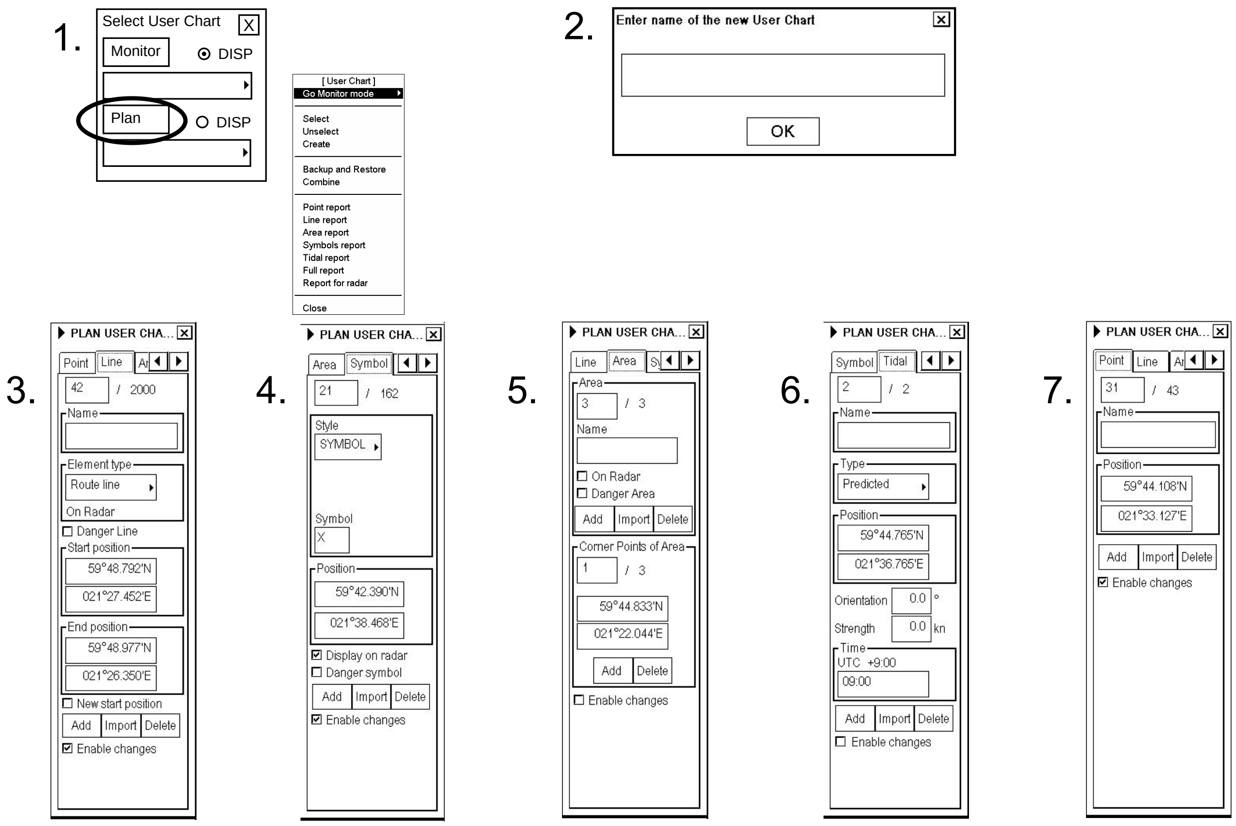
If "UserChart" in the sidebar is white (or black depending on color scheme in use) it means that the workstation is in the monitor mode user chart. To activate the plan mode and choose a user chart for the plan mode, do the following:

1. Put the cursor on UserChart in the sidebar.
2. Put the cursor on the down triangle mark in the Plan box, spin the scrollwheel to choose user chart then push the left button.



# 12.6 How to Create a User Chart

You can create and modify a user chart when you have chosen the plan mode of user chart.



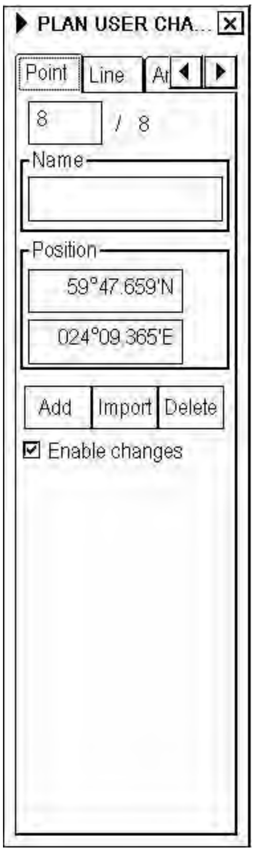

**Note:** If you want to display a user chart on the electronic chart, make sure, that Points, Symbols & Tidals, Lines and Areas of User chart are selected to Std or Oth from the Mariner page of the Chart Display menu.

To make a complete user chart, do the following:

1. Put the cursor on UserChart in the sidebar then click the **Plan** button. The Plan User Chart dialog box appears in the information area.
2. Put the cursor on the triangle in the dialog box, choose Create from the menu then push the scrollwheel. Enter a name for the user chart; spin the scrollwheel to choose character then push it to confirm character. Click the **OK** button to finish.
3. Click the Line tab, check Enable changes then click the **Add** button. Spin the scrollwheel in the Element type box to choose line type then push the scrollwheel. To start a new line from a new position, check "New start position". Check "Danger Line" if you want to use the line in chart alert calculation. Use the cursor to specify position for line point then push the left button.
4. Click the Symbol tab then check Enable changes. Click the **Add** button then Define Style (Symbol or Label), Name and Symbol character in case of symbol. "Display on radar" is automatically chosen; uncheck it if you do not want the symbol or label to appear on the radar. Check "Danger Symb" to use the symbol in chart alert calculation. Use the cursor to choose position for symbol or label then push the left button.
5. Click the Area tab then check Enable changes. To make a new area, click the **Add** button in the Area field. Define Name for area, define also if it is displayed on Radar display (On Radar) and used in Chart Alerts calculation (Danger Area). Use the cursor to choose position for points then push the left button.
6. Click the Tidal tab then check Enable changes. To mark a tidal on the screen, use the mouse to locate the cursor then push the left button. Define Name, Type, Orientation, Strength and Time for Tidal. The Tidal symbol is displayed only on the ECDIS display.
7. Click the Point tab then check Enable changes. Use cursor and left button to define location of points.

### 12.6.1 Point page

The Point page lets you define points on a user chart. To choose this page, push the right button (Next Card), click the tab with the left button.




**Enable changes:** Check in order to modify user chart.

Note: The user chart may only be modified in the Course-up or North-up mode.

**Point box:** Shows the current and total number of points.

**Name:** Permits naming of current point.

**Position:** Manually enter latitude and longitude of point in this box.

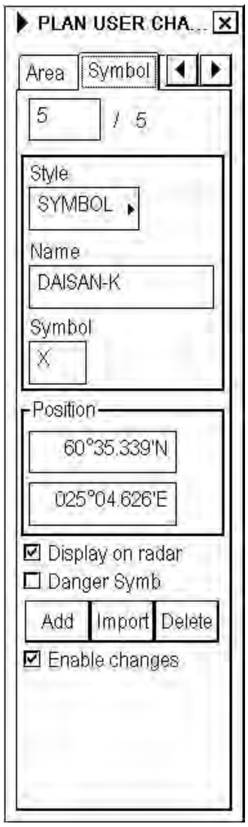
**Add:** Add new record next to current record with the same information.

**Import:** Choose a user chart from which to import points.

**Delete:** This function deletes current point.

### 12.6.2 Symbol page

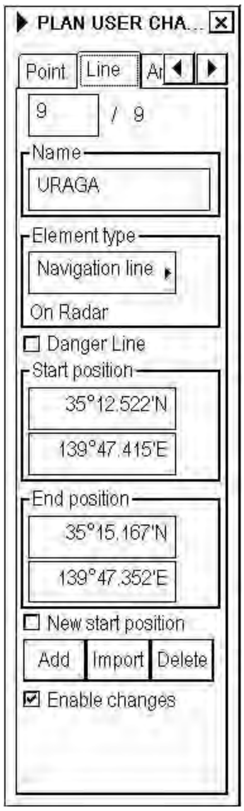
The Symbol page lets you draw symbols on a user chart. To choose this page, push the right mouse button (Next Card), click the tab with the left mouse button or hit the **NEXT** key on the keyboard-equipped control unit.




| | |
|---|---|
| **Enable changes:** | Check in order to modify user chart. |
| | Note: The user chart may only be modified in the Course-up or North-up mode. |
| **Symbol box:** | Shows the current and total number of symbols |
| **Style:** | You can choose either Label (displayed only on chart radar) or Symbol (displayed also on TT display). |
| **Name:** | If available, user can give name to symbol. |
| **Symbol:** | If available, user can give name for displayed text on chart radar |
| **Position:** | Manually enter latitude and longitude of symbol in this box. |
| **Display on radar:** | Check to also display the symbol on the radar screen. |
| **Danger Symbol:** | Check to use symbol in chart calculation. |
| **Add:** | Add new record to end of symbol list. |
| **Import:** | Choose a user chart from which to import symbols. |
| **Delete:** | This function deletes current symbol. |

### 12.6.3 Line page

The Line page lets you inscribe lines on a user chart. To choose this page, push the right mouse button (Next Card), click the tab with the left mouse button or hit the **NEXT** key on the keyboard-equipped control unit




**Enable changes:** Check in order to modify user chart.

**Note:** The user chart may only be modified in the Course-up or North-up mode.

**Line box:** Shows the current and total number of line points.

**Name:** Permits naming of current line.

**Element type:** User can choose appropriate line type from combo box. Available types are:

- Navigation line
- Route line
- Depth contour
- Coast line

Navigation and route lines may also be displayed on the Radar screen. Depth contours and coastlines are visible only on the chart radar display.

**Danger Line:** Check to use line in chart alert calculation.

**Start position:** Manually enter starting latitude and longitude in this box.

**End position:** Manually enter ending latitude and longitude of line in this box.

**New start position:** Check to draw a new line. If unchecked, any newly entered line will be connected to previous line.

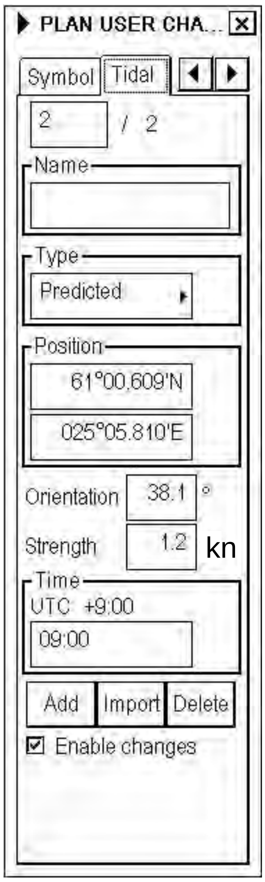
**Add:** This function adds new record next to current record. User can either edit position by entering new co-ordinates or by showing new location with the trackball and left button.

**Import:** Choose a user chart from which to import lines.

**Delete:** This function deletes current record of line.

### 12.6.4 Tidal page

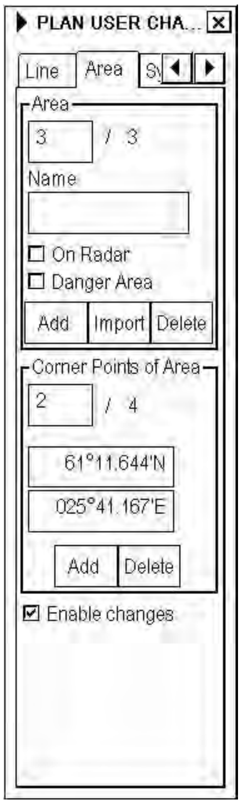
The Tidal page lets you inscribe tidal data on a user chart. To choose this page, push the right button (Next Card), click the tab with the left button.




| | |
|---|---|
| **Enable changes:** | Check in order to modify user chart.<br>**Note:** The user chart may only be modified in the Course-up or North-up mode. |
| **Tidal box:** | Shows the current and total number of tidal points. |
| **Name:** | Permits naming of current tide. |
| **Type:** | User can choose type of tide here. |
| **Position:** | Manually enter latitude and longitude of tide in this box. |
| **Orientation, Strength and Time:** | You can enter speed, course and time for tide. Note that time of the tide is always in local time. |
| **Add:** | This function adds new record next to current record. |
| **Import:** | User is able to choose from the list of user charts to import to current tidal file. |
| **Delete:** | This function deletes current record of tide. |

### 12.6.5 Area page

The Area page lets you inscribe areas on a user chart. To choose this page, push the right button (Next Card), click the tab with the left button.




**Enable changes:**

Check in order to modify user chart.

**Note:** The user chart may only be modified in the Course-up or North-up mode.

#### *Area window*

When a user defines an area for a user chart he adds an area object then gives a name and chooses if it is displayed on radar and/or if it is used for safe water calculation (Danger Area).

**Area box:** Number of current area appears in this field. User can choose area by editing desired number in the Current box or create new one.

**Name:** You can assign a name to the current area.

**On Radar:** Check to also display the area on the Radar display.

**Danger Area:** Check to include the current area in chart alert calculation.

**Add:** Sets different area. Click button then set area.

**Import:** Import area.

**Delete:** Delete area.

**Corner Points of Area:** See description on next page.

### How to add a new area to a user chart

An area of a user chart can be used, for example, to define a safe water area for display on the Radar. To add a new user chart area, do the following:

1. Open the Area page as described on the previous page. Check Enable changes.
2. Click the **Add** button in the Area field.
3. Give a name for the area and check Danger Area to use it in chart alert calculation and check "On Radar" to show the area on the radar as well.
4. Define corner points on the electronic chart area using the cursor and the left button.
5. To define more areas, continue from step 2.

### How to select an area of a user chart to modify

In the Area field, the topmost box displays the user charts selected for modification. To modify a different area, two methods are available:

- Enter desired area number in the box at the top of the Area window, and use the scrollwheel to enter applicable number.
- Use the Info feature to find area. Put the cursor on the desired corner point of the area on the electronic chart then push the scrollwheel.

### How to change position of corner point

The easiest way to move a corner point is to drag and drop it to a desired position. This can be done as follows:

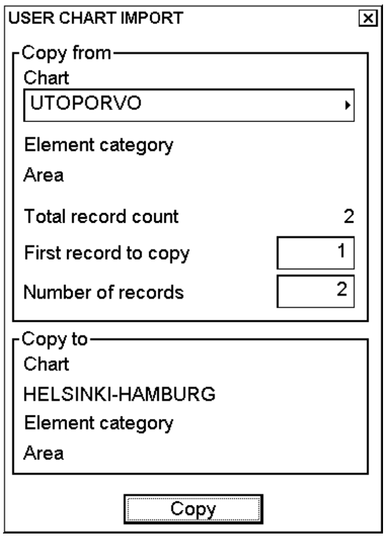
1. Open user chart then check Enable changes on the Plan User Chart dialog box.
2. Choose appropriate chart scale so you can see desired area of user chart on display.
3. Put the cursor on the corner point you want to move to a new position.
4. While pressing and holding down the left button, roll the trackball to put the cursor on desired position. Keep the button held down while you move the cursor and release it when the cursor is at the position desired.

### How to delete an area from a user chart

To completely delete an area from a user chart, check Enable changes on the Plan User Chart dialog box. Choose desired area object to display from the Area field then click the **Delete** button.

# 12.7 How to Import an Area to a User Chart

You can copy Areas of User Chart from another User Chart file to active User Chart file.




1. Click the **Import** button in the Area field, and the User Chart Import dialog box appears.
2. In the Chart box, select chart from which to copy areas; spin the scrollwheel to choose a chart then push the scrollwheel.
3. "Total record count" shows number of areas stored in chosen user chart. Enter into the "First record to copy" field the area number from which you want to start copying.
4. Enter in the "Number of records" field how many areas you want copy into the active user chart file.
5. Click the **Copy** button to copy chosen areas. If you do not want copy, click the X at the top right corner to quit.

## 12.7.1 How to add a new point, symbol, line or tidal to a user chart

In this manual the term "user chart object" refers to any of point, symbol, line or tidal. The procedure for modifying a user chart object is common to all user chart objects. To choose a user chart object to modify, open the appropriate user chart object page in the Plan User Chart dialog box.

To modify user chart areas, see section 12.6.5 Area page.

To add a new user chart object you have following two methods available:

- Use the left button (Edit Insert feature).
- Click the **Add** button in corresponding user chart object page.

**To add a new user chart object by using the left button, do the following:**

1. Open desired user chart object page.
2. Put the cursor in the electronic chart on the desired position then push the left button. New user chart object appears.
3. Modify data of added user chart object. For how to modify point, symbol, line and tidal data, see section 12.7.2 How to change other data of point, symbol, line or tidal.

**To add a new user chart object by using the Add button, do the following:**

1. Open desired user chart object page.
2. Click the **Add** button in the chosen user chart object page. This adds a new user chart object to the end of file, which is a copy of current user chart object.
3. Modify position of user object. Modify position following "How to change position of a point, symbol, line or tidal" on the next page.
4. Modify other data of user chart object. For how to modify position, see section 12.7.2 How to change other data of point, symbol, line or tidal.

### *How to select a point, symbol, line or tidal to modify*

In this manual the term "user chart object" refers to any of point, symbol, line or tidal. The procedure for modifying a user chart object is common to all user chart objects. To choose the user chart object to modify, open the appropriate user chart object page. In the Current field, the number indicates user chart object that is currently chosen for modification. If you want to select a different number, do one of the following:

- Enter desired number of user chart object in the Current box. To change the number put the cursor in the Current box, spin the scrollwheel to choose number then push the scrollwheel. Click the **OK** button.
- Use the Info feature to find area. Put the cursor on the desired corner point of the area on the electronic chart then push the scrollwheel.

### *How to change position of a point, symbol, line or tidal*

You can change the position of a user chart object two ways:

- Enter latitude and longitude in the Position field.
- Drag and drop a user chart object with the left button.

### *How to enter latitude and longitude in position field*

1. Open desired user chart object page.
2. Choose desired user chart object.
3. Enter co-ordinates in the Position field. To change a co-ordinate, put the cursor to the right of the digit to change, in the appropriate box, push the left button, spin the scrollwheel to choose desired value then push the scrollwheel. Note that lines have starting and ending point position fields.

### *How to drag and drop a user chart object to new WPT position*

1. Open desired user chart object page.
2. Put the cursor on the user chart object in the electronic chart area and press and hold down the left button while rolling the trackball to position the user chart object.
3. Keep the button pressed down while you move the cursor and release it when the cursor is at the position desired.

## 12.7.2 How to change other data of point, symbol, line or tidal

To change other data of a user chart object, such as name, symbol, element type, do the following:

1. Choose desired user chart object. For more information, see "Choosing a point, symbol, line to modify"
2. Put the cursor in desired edit box then use the scrollwheel to enter data. Push the scrollwheel to confirm.

## 12.7.3 How to delete a point, symbol, line or tidal

To delete a user chart object, do the following:

1. Open desired user chart object page.
2. Choose user chart object to delete.
3. Click the **Delete** button in the chosen user chart object page.

### 12.7.4 How to import points, symbols, lines or tidals from other user chart

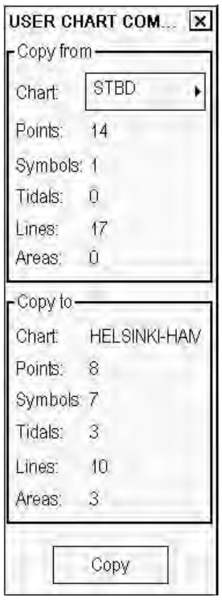
User is able to choose User chart objects from other user chart to import them to current User chart. To import User chart object do the following:

1. Open desired user chart object page.
2. Click the **Import** button. The dialog box shown right appears.
3. In the Chart box, choose the chart from which to copy user chart objects.
4. The Element category field shows the category elements that will be copied.
5. In the First record to copy box, enter the number of the object from which to begin copying.
6. In the Number of records box, enter number of records to copy.
7. Click the **Copy** button to copy.

## 12.8 How to Join Two or More User Charts

The chart radar allows you to combine two or more user charts into one user chart. To join two or more user charts, do the following:

1. In the sidebar Click UserChart followed by Plan to show the Plan User Chart dialog box.
2. Put the cursor on the triangle in the Plan User Chart dialog box to display the menu.
3. Choose a chart with "Select" and press the **OK** button, or choose "Create" and create a new chart.
4. Choose Combine then push the scrollwheel.
5. From the Chart box, choose a chart then push the scrollwheel.

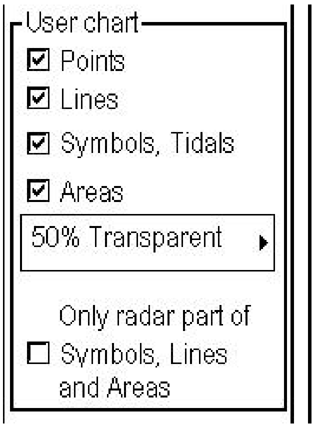


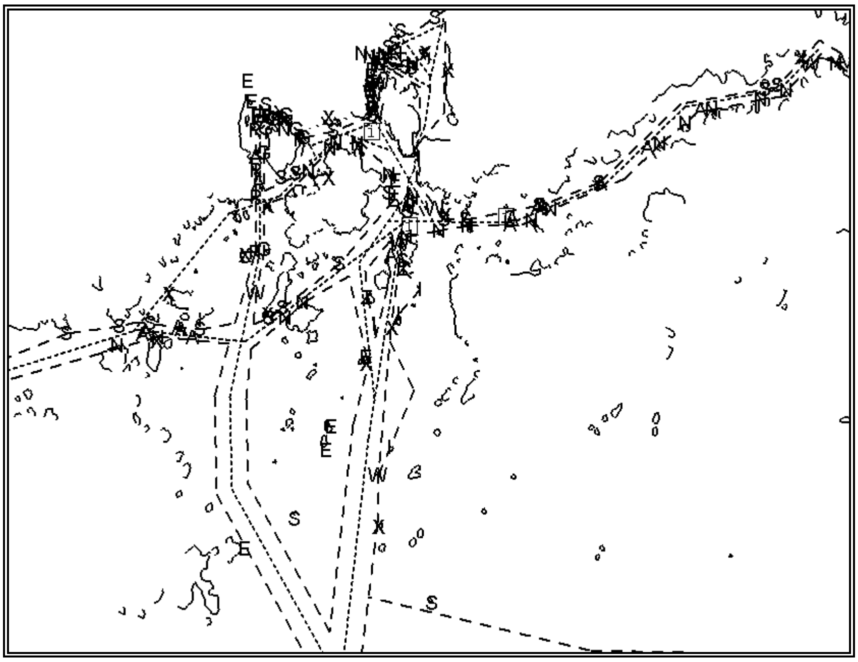

6. Click the **Copy** button.

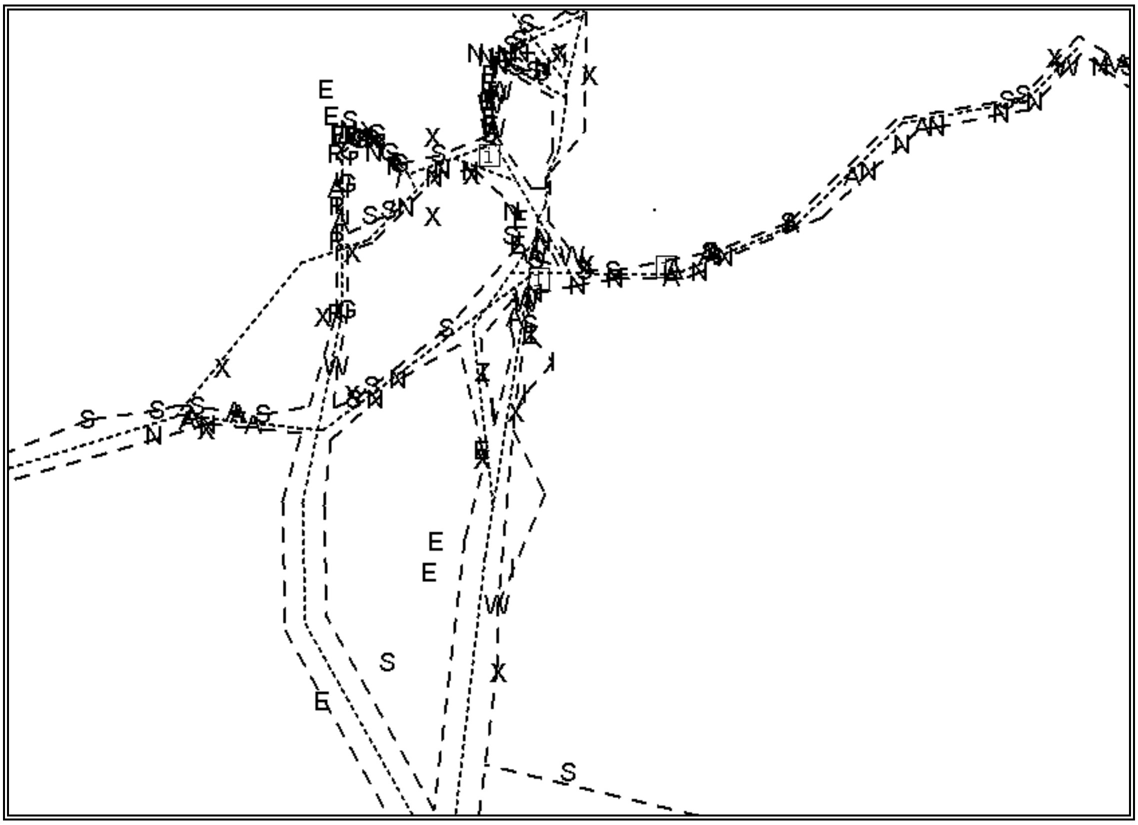
# 12.9 How to Display User Charts

User charts can be displayed on the chart radar display, and you can choose which chart objects to display from the Mariner page in the Symbol Display dialog box. Below are some examples from the same user chart with different selections.

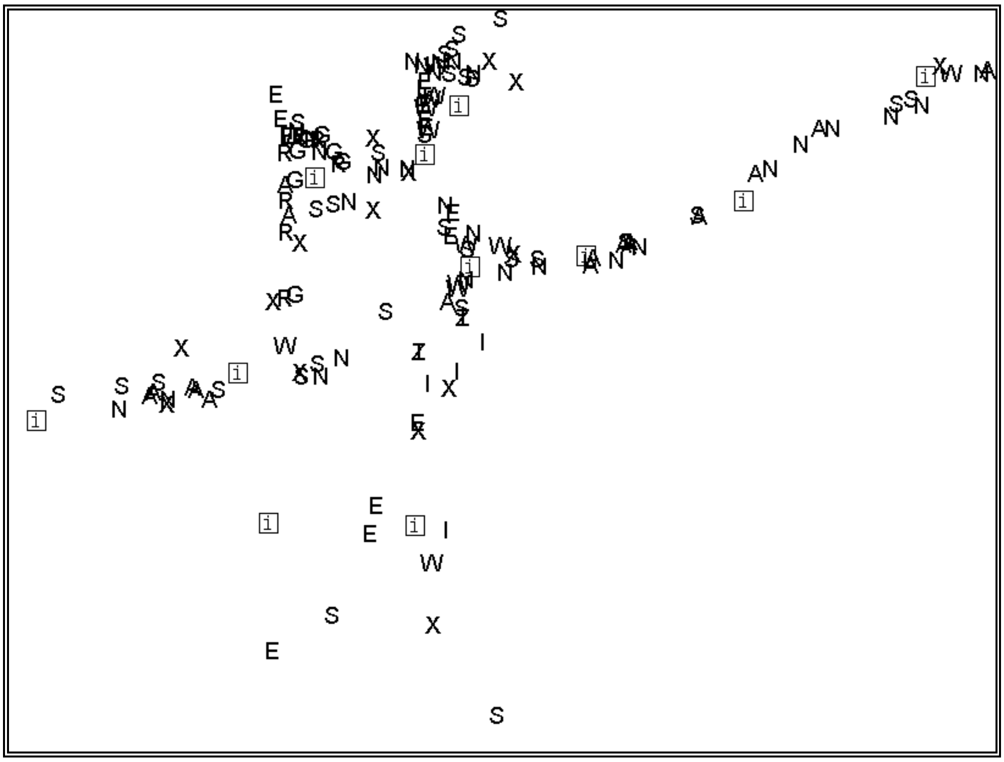
This user chart has all user chart objects displayed.



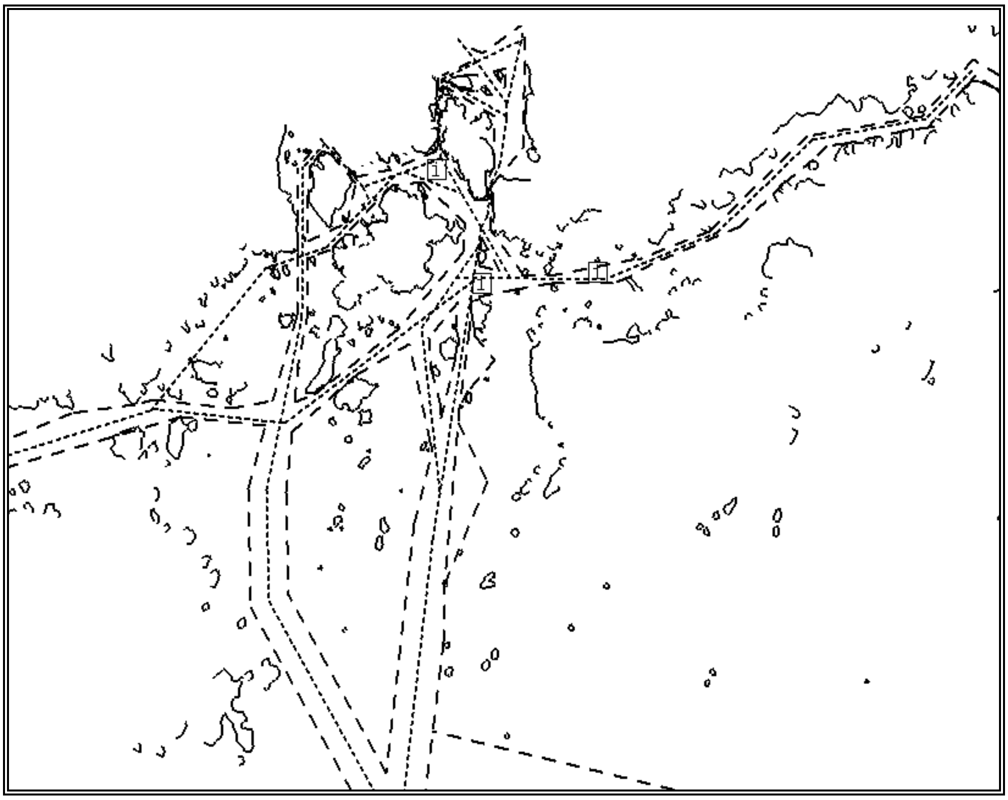





*An example with only radar part of lines, symbols and areas displayed*



*An example with only symbols and points displayed. Note that this is also a very good example how many and where the points should be defined.*

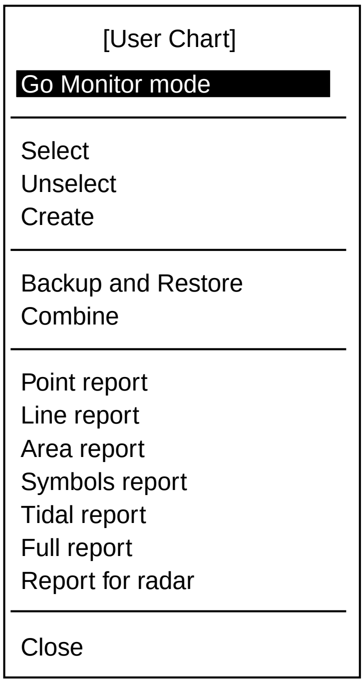


*No symbols displayed*

# 12.10 Reports

You can generate a report for each chart object (point, line, area, symbol and tidal) as follows:

1. Click UserChart in the sidebar then click the **Plan** button to show the Plan User Chart dialog box.
2. Put the cursor on the triangle in the dialog box to show the User Plan menu.

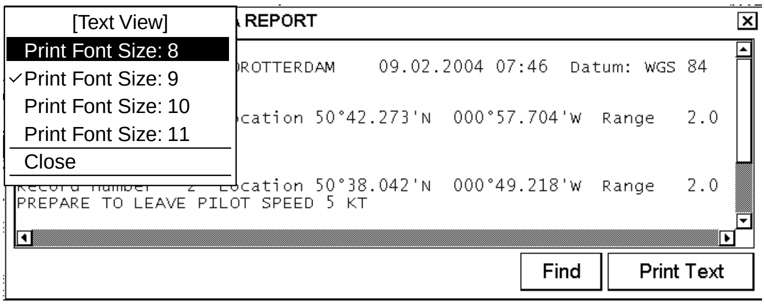



3. Choose desired report from the report group then push the scrollwheel.
4. To print the report, click the **Print Text** button.

### *How to change font size in report*

If you want to change the size of the font in a report hard copy, do the following:

1. Put the cursor onto the triangle in the report window.




2. Spin the scrollwheel to choose desired font size from the list then push the scrollwheel.

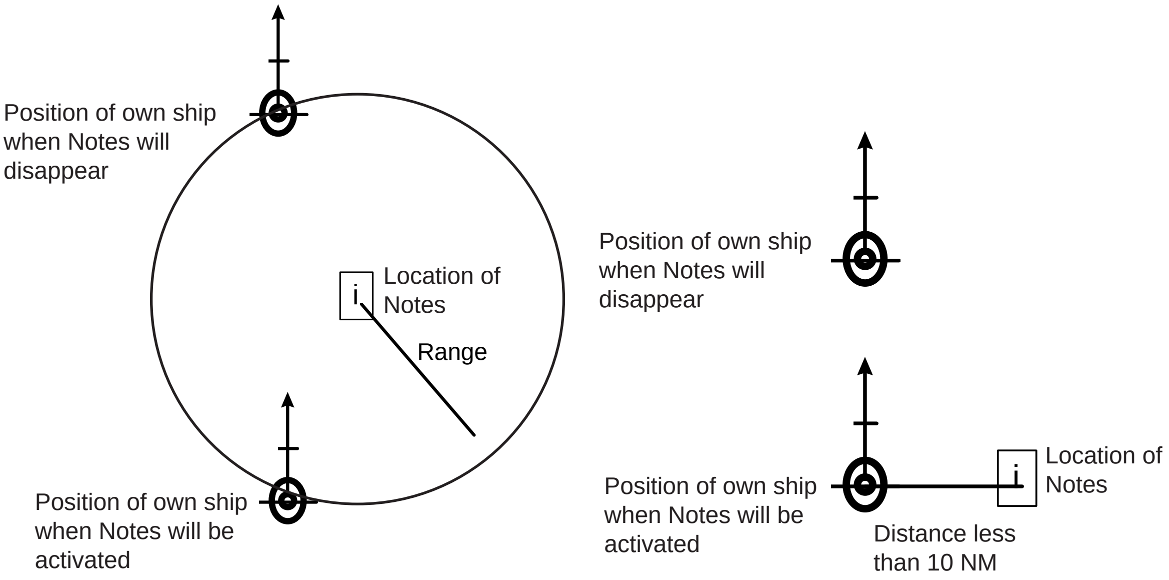
# 13. Notes

## 13.1 Introduction

A navigation-related notebook is called "Notes". Notes is a "notebook data" file that provides messages for the operator relative to a specific ship position in the monitor mode. The user specifies range for each Notes record. The chart radar compares Notes range and own ship position and displays Notes when own ship goes within the range set for the Notes. (See figure below.)

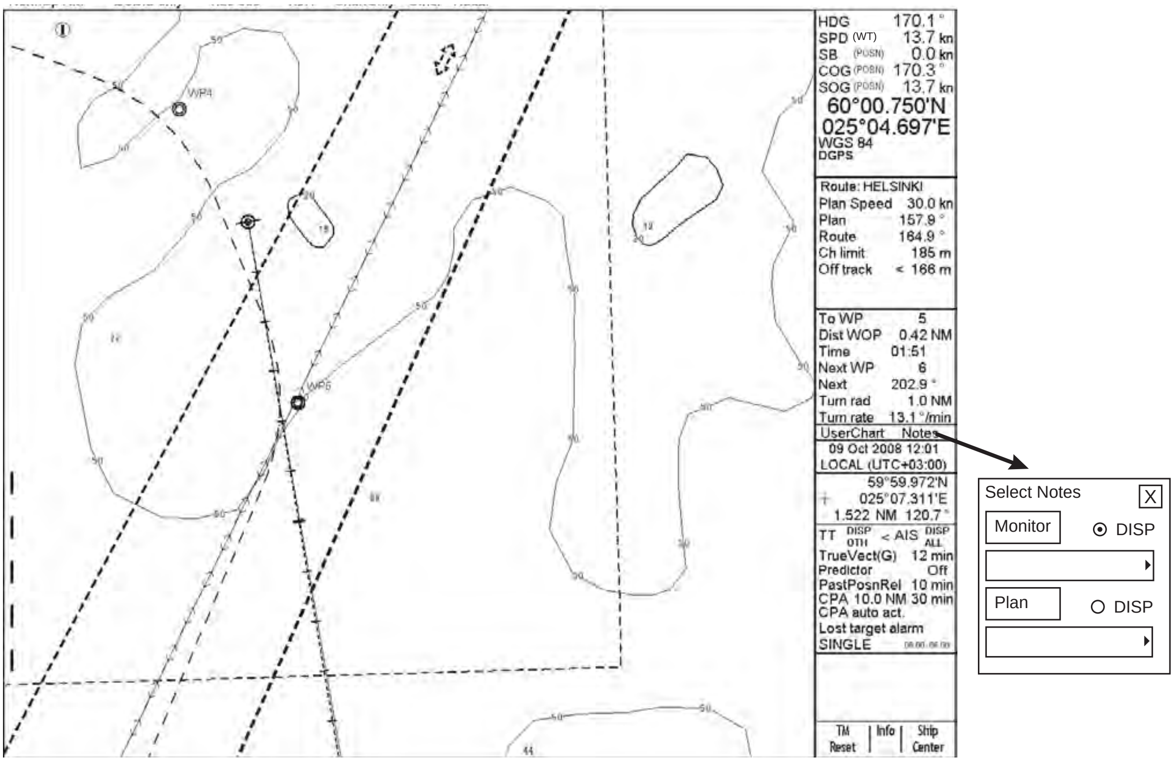
The operator may assign a brief message that will appear on the radar display together with the notice of the proximity of the relevant point.

While the ship sails, notebook pages (= records) in the chosen Notes file are compared with own ship position once per minute to choose Notes. Further, when the ship has passed a waypoint, the system will make a comparison against own ship position. If the system finds that you have arrived within a new Notes notebook page, it generates the alert "850 Notes: New record".



### 13.1.1 Notes modes

Notes can be chosen for the monitor mode, which means that Notes gives predefined messages for the operator relative to a specific ship position. Another mode is for modifying Notes in the plan mode. In the plan mode, Notes is used to define predefined messages relative to own ship position. Eventually the monitored and planned Notes copy the operation of the monitored and planned routes. Below is an example of how to know which Notes is used in the monitor mode and which is used in the plan mode.

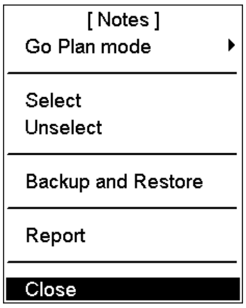


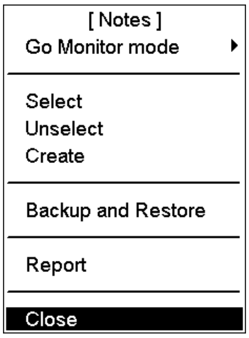

The Notes field in the information area always shows the name of the Notes chosen for the monitor mode. If the displayed Notes on the ECDIS display is the monitored Notes, then the text "Notes" is in black (or white depending on color scheme). If the displayed Notes on the ECDIS display is the planned Notes, then the text "Notes" is in red. The name of the planned Notes is only available in the dialog box for the plan mode of Notes.

## 13.2 How to Use Notes

To prepare Notes, do the following:

1. Put the cursor on Notes in the sidebar, then click the **Plan** or **Monitor** button as appropriate. If no Notes is chosen, the Notes menu (shown below) appears in addition to the Monitor Notes dialog box or Plan Notes dialog box.
2. If no menu appears, click the same button once more to open the menu.




**Activate Monitor/Plan mode:** User can switch Notes mode between plan and monitor. Using
**Go Monitor mode> Go Monitor mode,** Notes used in the plan mode can be switched directly to the monitor mode.
**Go Plan mode> Go Plan mode,** Notes used in the monitor mode can be switched directly to the plan mode.

**Select:** Chooses Notes to use; monitor or plan mode.

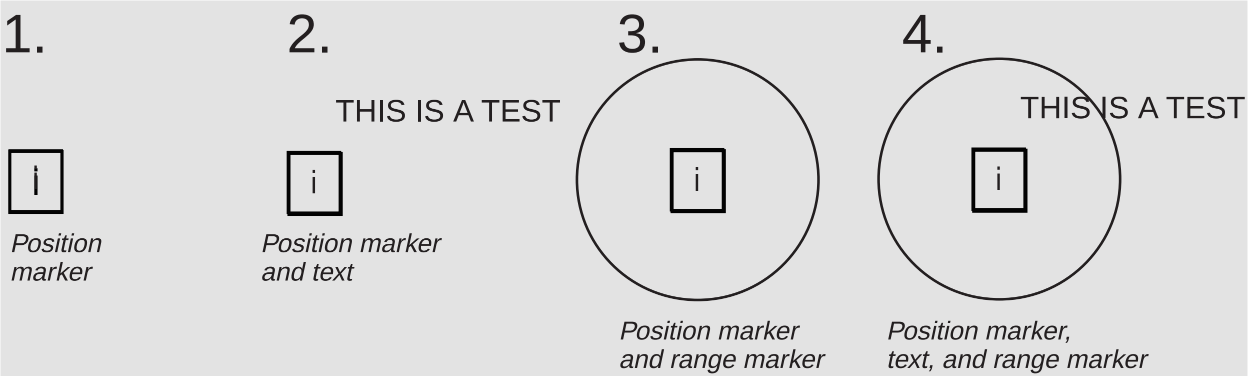
**Unselect:** Unselect removes Notes from active use.

**Create:** Creates new Notes. Notes can be named, using up to 30 alphanumeric characters.

**Backup and Restore:** User can make backup copy from Notes or restore from backup media.

**Report:** Generates tabulated report from chosen Notes.

**Note:** If you want Notes to be displayed on the electronic chart, make sure that Notes options are turned on in the Mariner page of the Chart Display dialog box.

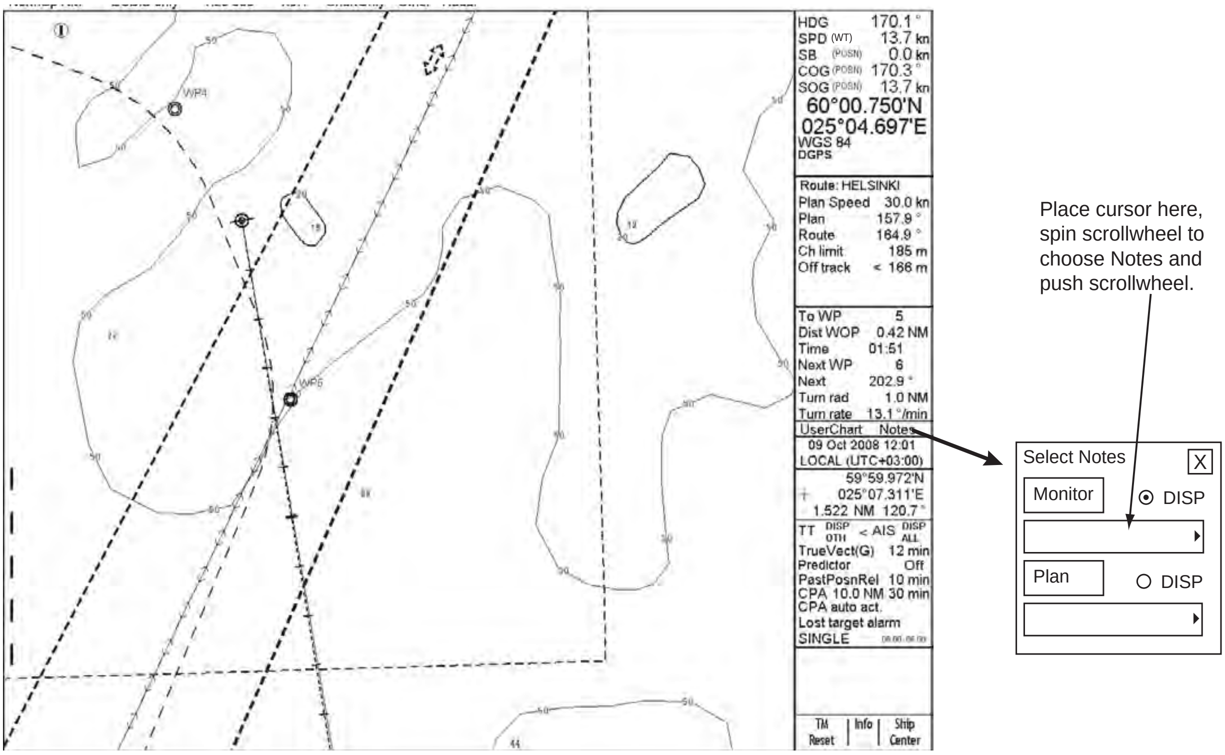



Four different variations as examples of how Notes is presented on the chart area:

1. Position marker
2. Position marker and text
3. Position marker and range marker
4. Position marker, text and range marker

# 13.3 How to Select Notes to use in Monitor mode

Notes that are for system use appear in the Notes field in the sidebar. If the text "Notes" is red this means that the workstation is in the plan mode for Notes. To activate the monitor mode and choose Notes for the monitor mode, do the following:

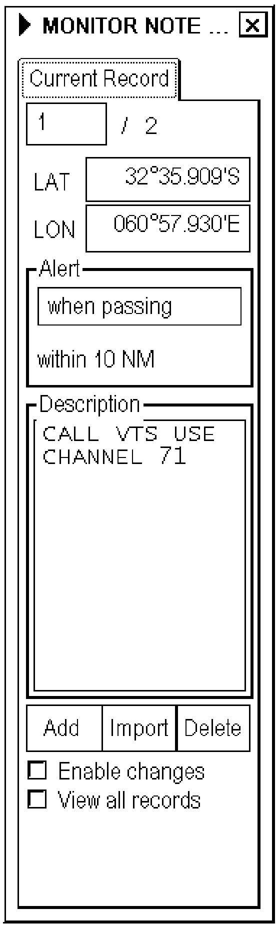


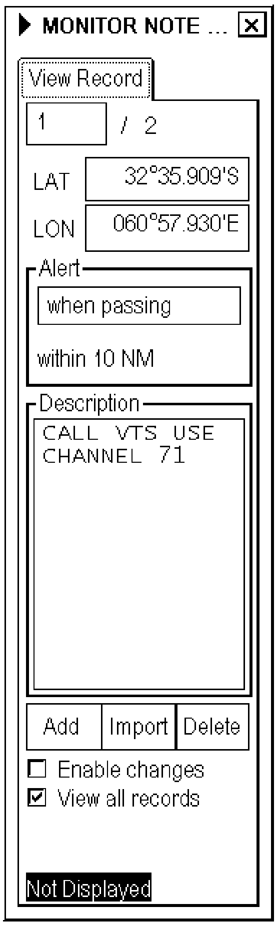
### 13.3.1 Monitor Notes dialog box description

***Current record page***

If "View all records" is not chosen (checked):

- Opens "Current Record" page.
- When the ship is within the range set for a Notes, the information of current record appears, something like the dialog box shown right.




***View record page***

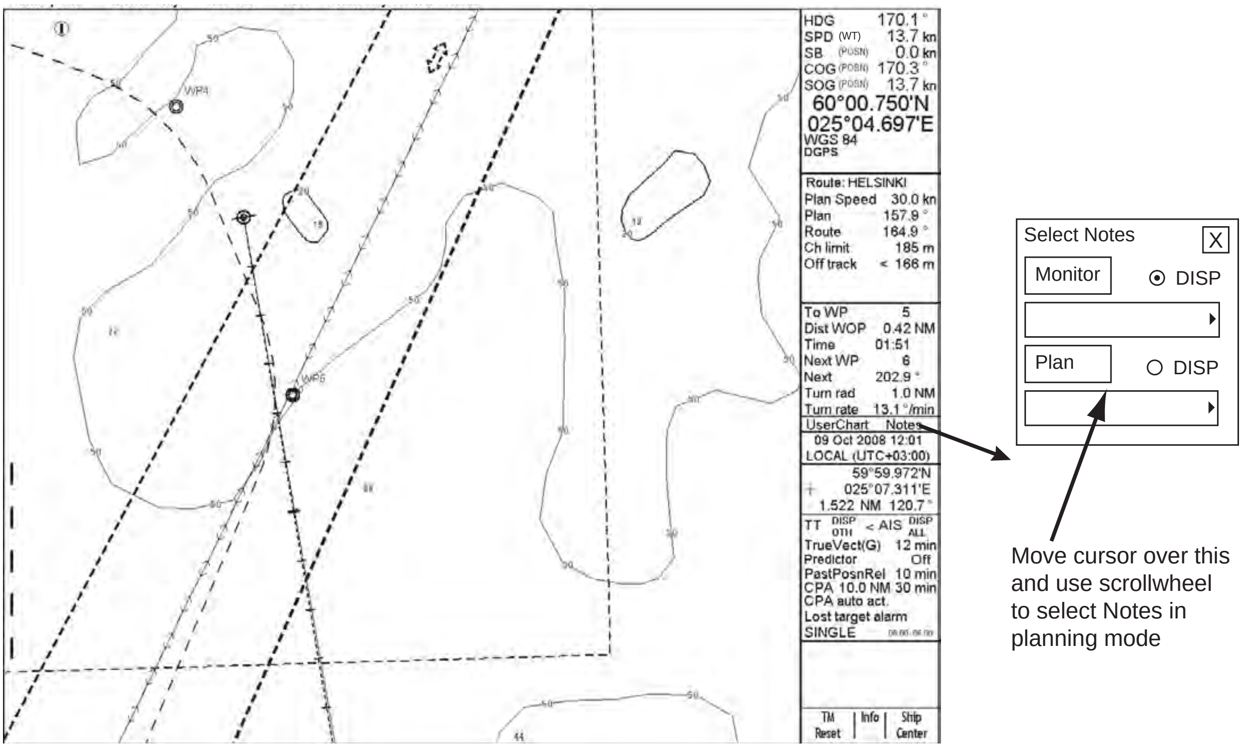
If "View all records" is chosen:

- Opens "View Record" page.
- Choose "View all records".
- You can view any Notes record by clicking the arrow keys.

| | |
|---|---|
| **View record box:** | This indicates current number of active records. |
| **LAT, LON:** | This indicates the latitude and longitude position of current record (LAT, LON). |
| **Alert:** | Control range for the system to activate current record of Notes. |

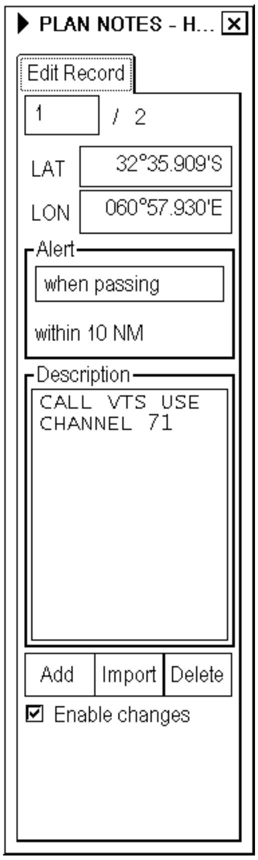
# 13.4 How to Select Notes to use in Plan mode

If the Notes in the sidebar is black (or white depending on color scheme) this means that the workstation is in the monitor mode for Notes. To activate the plan mode and choose Notes for the plan mode, do the following:



### 13.4.1 Plan Notes dialog box description

***Edit record page***




**Edit Record box:** This indicates current number of active records.

**Enable changes:** Check to enable changes.

**Note:** Notes may only be modified in the North-up or Course-up mode.

**LAT, LON** Indicates the latitude and longitude position of current record.

**Alert:** Range from own ship at which current Notes is activated on the screen or when passing notes distance is fixed to 10 NM.

**Description:** The operator may edit a Notes message record, which appears on the screen, after the ship has passed the calculated point. To edit the text, put the cursor in the text window, spin the scrollwheel to choose character then push the scrollwheel.

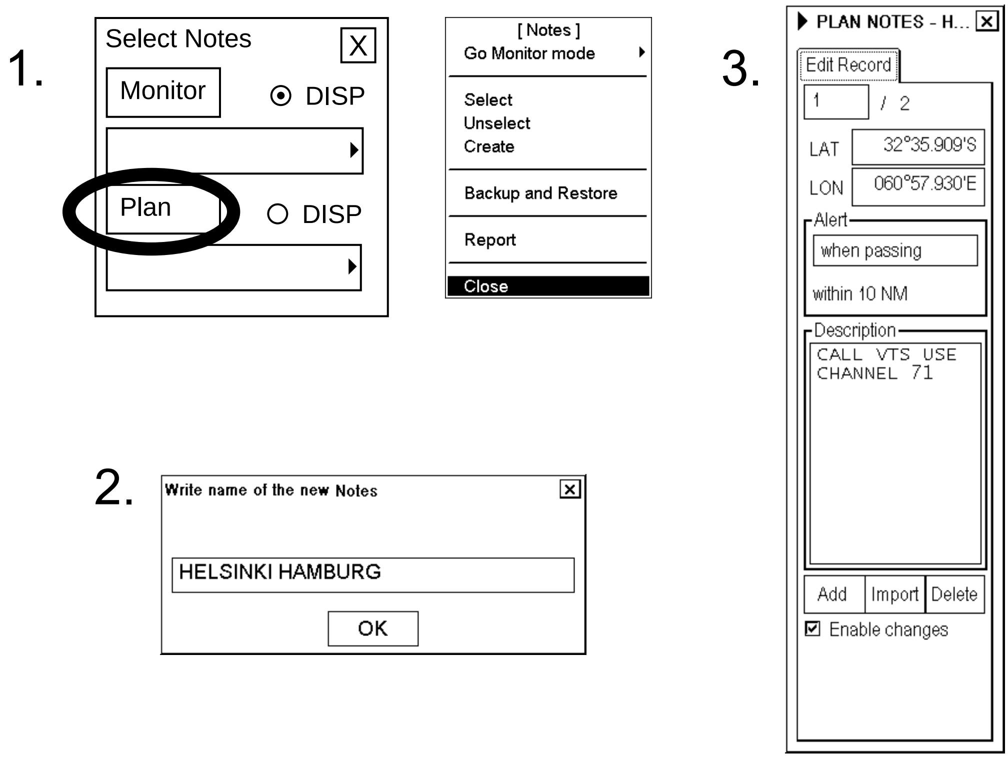
**Add:** This function adds a new record next to current record. User can edit position by entering new co-ordinates or by choosing new location with the trackball then pushing the left mouse button.

**Import:** You can import an existing file (whole file or part of file), to current Notes file.

**Delete:** Deletes current record of Notes.

# 13.5 How to Create New Notes

You can create and modify Notes, and this can be done in the plan mode. It is recommended to use the true motion display mode while editing.




To create a new Notes, do the following:

1. Put the cursor on Notes in the sidebar then click the **Plan** button to show the Plan Notes dialog box. If you have not already chosen Notes, the plan Notes menu also appears. If the menu is not displayed, click the triangle mark in the dialog box. Choose Create from the menu then push the scrollwheel.
2. Enter a name for the user chart, spinning the scrollwheel to choose character then pushing the scrollwheel to confirm.
3. In the Edit Record page of the Plan Notes dialog box, check "Enable changes". Roll the trackball to put the cursor on the location desired for Notes then push the left button. In the Range box, enter the range from own vessel at which to activate the Notes. To show text message on the screen, enter desired message in the text window; spin the scrollwheel to choose character then push the scrollwheel to confirm.

## 13.5.1 How to add new Notes record

To add a new Notes record the following choices are available:

- Using the left button.
- Using the **Add** button in the Edit page.

### *To add a new Notes record by using the left button:*

1. Open the Edit page of the Plan Notes dialog box and check Enable changes.
2. Put the cursor on the location in the chart area where you want to add a new Notes, then push the left button. New Notes record appears at the end of file.
3. Modify Range, Position, text message, etc. as appropriate.

***To add a new Notes record by Add button:***

1. Open the Edit page of the Plan Notes dialog box then check Enable changes.
2. Click the **Add** button. This adds a new Notes record to the end of record, and it is a copy of current Notes record.
3. Modify position of Notes record. For how to modify position, see section 13.5.3 How to change Notes record position.
4. Modify other data of Notes record as appropriate. For how to modify other data in a Notes record, see section 13.5.4 How to change other data of Notes record.

### 13.5.2 How to select Notes record to modify

The Current box in the Plan Notes dialog box shows the Notes currently selected for modification. To choose a different Notes the following methods are available:

- Enter desired record number in the Current box, using the scrollwheel; spin the scrollwheel to choose record number then push the scrollwheel.
- Put the cursor on desired Notes in the electronic chart area, then push the scrollwheel.

### 13.5.3 How to change Notes record position

To change the position of a Notes, two choices are available:

- Enter latitude and longitude in the Position field on the Edit page.
- Drag and drop Notes mark using the trackball and left button.

***How to enter latitude and longitude in position field***

1. Open the Edit page of the Plan Notes dialog box then check Enable changes.
2. Choose desired Notes, following section 13.5.2 How to select Notes record to modify.
3. Enter co-ordinate in Lat (Lon) field as appropriate. Spin the scrollwheel to change digit then push the scrollwheel to confirm.

***How to drag and drop Notes to new WPT position***

1. Open the Edit page of the Plan Notes dialog box then check Enable changes.
2. Use the trackball to put the cursor on the Notes you wish to move.
3. Press and hold down the left button while rolling the trackball to position the Notes mark where desired. Keep the button pressed and held down while you move the cursor and release it when the cursor is at position desired.

### 13.5.4 How to change other data of Notes record

To change function range or character data of Notes, such as range and text, do the following:

1. Choose desired Notes, following section 13.5.2 How to select Notes record to modify.
2. Put the cursor in the desired edit box, spin the scrollwheel to choose desired value, then push the scrollwheel to confirm.

### 13.5.5 How to delete a Notes record

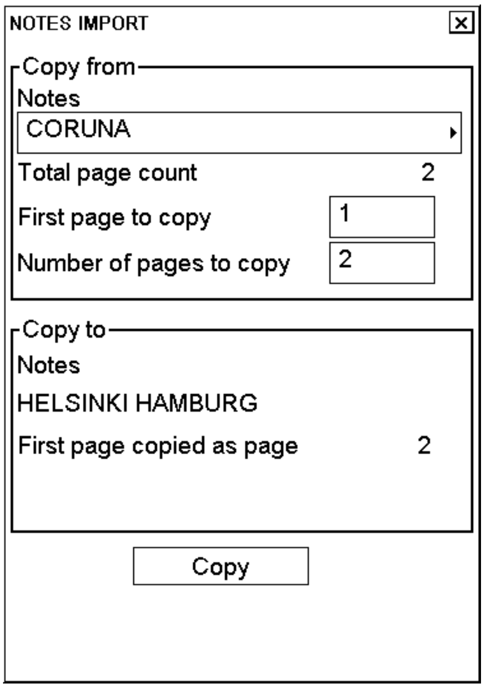
To delete a Notes record, do the following:

1. Open the Edit page of the Plan Notes dialog box then check Enable changes.
2. Choose desired Notes, following section 13.5.2 How to select Notes record to modify.
3. Click the **Delete** button.

### 13.5.6 How to import Notes from other routes

You can import Notes records from other Notes records as follows:

1. Open the Edit page of the Plan Notes dialog box then check Enable changes. Click the **Import** button to show the following dialog box.




2. In the Notes field, choose the source Notes.
3. Enter first Notes record to copy in the First page to copy field.
4. Enter number of Notes records to copy in the Number of pages to copy field.
5. "Copy to Notes" shows where the Notes record is to be copied to and "First page copied as page" shows the number that the first record from the Notes source will be copied into the current Notes.
6. After confirming settings, click the **Copy** button to import Notes records.

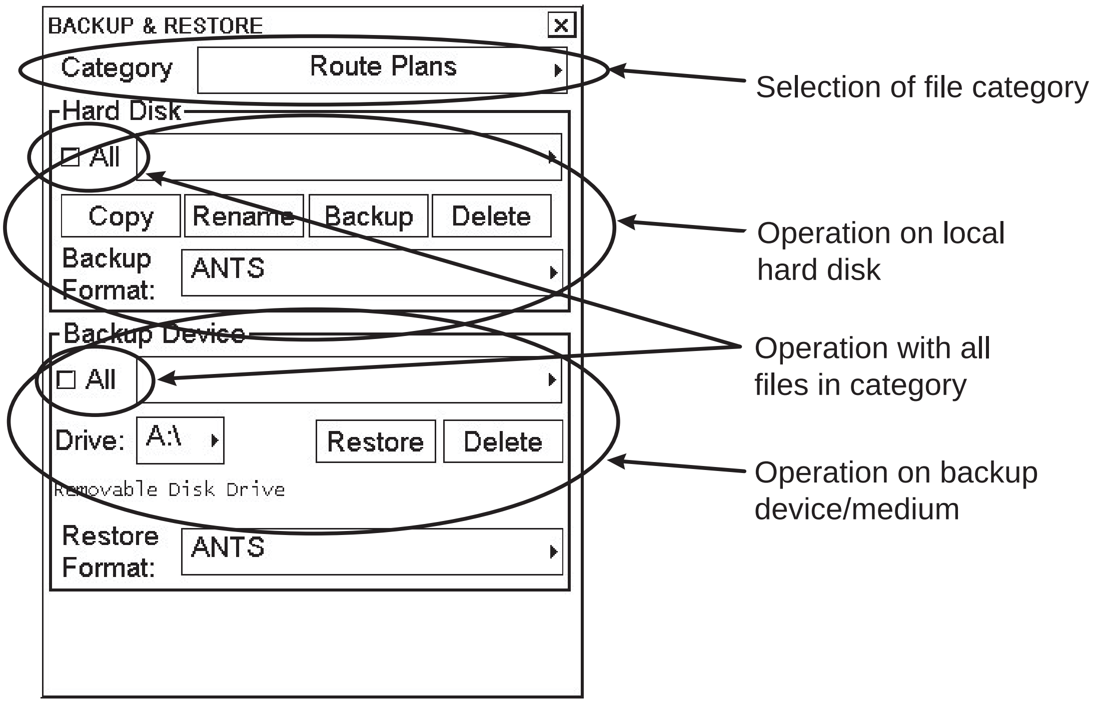
# 14. Backup Operations

## 14.1 Introduction

There are several menus from which the user may initiate backup and restore functions. From those menus the user may execute hard disk operations such as backup, copy, rename and delete. The user may make backup copies to backup devices or restore from backup device to hard disk. These pushbuttons and menu commands, which are used to access the system's database, are listed below.

**Note:** Use only PC-formatted floppy disks.

The Backup & Restore dialog box is where backup and restore operations are initiated.




### *Choosing appropriate file category*

The system automatically chooses corresponding file depending on your selection. The categories consist of the following files:

- Route plans
- User charts
- Notes
- Installation parameters
- Chart display settings
- Paper chart setup
- Presentation libraries
- Logs
- Manual updates
- All charts and updates

You can choose desired category from the File category box in the Backup & Restore dialog box. For the chosen category, the system shows all the possible functions executable with the chosen category.

## 14.2 File Operations

### How to copy a file

You can make a copy of an original file using the Copy function in the Backup & Restore dialog box. To copy a file, do the following:

1. Choose desired file category.
2. Choose desired file from the Hard Disk field.
3. Click the **Copy** button.
4. Enter new name for chosen file then click the **OK** button.

### How to rename a file

You can rename a file using the Rename function in the Backup & Restore dialog box. To rename a file, do the following:

1. Choose desired file category from the Category field.
2. Choose desired file from the Hard Disk field.
3. Click the **Rename** button.
4. Enter new name for chosen file then click the **OK** button.

### How to delete a file

You can delete a file as follows:

1. Choose desired file category.
2. Choose desired file from the Hard Disk field.
3. Click the **Delete** button.

## 14.3 Floppy Disk Operations

### How to back up a file to a floppy disk

You can make a backup from an original file to a floppy disk. To make a backup of a file to a floppy disk, insert a floppy disk in the disk drive, then do the following:

1. Choose desired file category.
2. Choose desired file from the Hard Disk field.
3. Choose desired Drive from the Drive field.
4. Click the **Backup** button.

### How to read a file from a floppy disk

You can restore a file with one stored on a floppy disk. To restore a file stored on a floppy disk, do the following:

1. Choose desired file category.
2. Choose desired Drive from the Drive field.
3. Choose desired file from the Backup Device field.
4. Click the **Restore** button.

# 14.4 Vector Format Data

### *How to load vector data*

Route and user chart files can be read in vector system format (Inc) files. When loading Inc format files, the chart radar converts the files to the format used with the chart radar. To do this, do the following:

1. Choose Backup and Restore from the menu.
2. Choose backup drive from the Backup device field.
3. From the Backup Device field, choose desired file.
4. Click the **Restore** button in the Backup Device field.

### *How to save vector data*

The Route and User chart files can be read in vector system format (Inc). When moving files from the chart radar to a backup device the chart radar converts the file to Inc format.

To do this:

1. Choose Backup and Restore from the menu.
2. From the Hard Disk field, choose desired file then choose Inc in the Backup format box.
3. Choose backup drive from the Backup device field.
4. Click the **Backup** button in the Hard Disk field.

# 14.5 ASCII Text File

### *How to save ASCII file as a route*

Sometimes it is useful to save route information as an ASCII text file for use with some other application, or to restore some ASCII text produced by some other application to the chart radar.

The following formats are available for route backup and restore:

- ASCII PROPRIETARY
- ASCII POSITION (list of Latitude/Longitude values)
- ASCII WPNAME POSITION (list of WP names and Latitude/Longitude)
- ASCII POSITION WPNAME (list of Latitude/Longitude and WP names)
- ASCII FULL (all route related information)

To make a backup of a route in ASCII format, do the following:

1. Choose the Backup and Restore command from the menu.
2. From the Hard disk field, choose desired file.
3. Choose desired backup format with Backup format.
4. Choose backup drive in the Backup drive field.
5. Click the **Backup** button in the Hard Disk field.

### *How to read a route from an ASCII file*

Sometimes it is useful to restore to the chart radar route information stored in an ASCII text file that was produced by some other application.

The following formats are available for route backup and restore:

- ASCII PROPRIETARY
- ASCII POSITION, list of Latitude/Longitude values
- ASCII WPNAME POSITION, list of WP names and Latitude/Longitude
- ASCII POSITION WPNAME list of Latitude/Longitude and WP names
- ASCII FULL, all route related information

To restore a route using ASCII data, do the following:

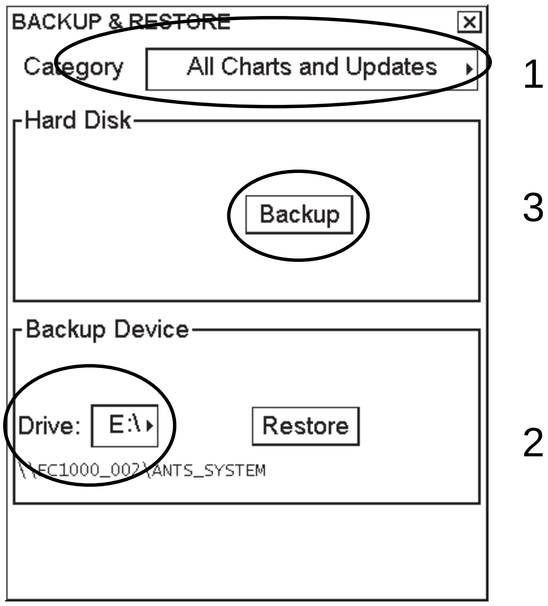
1. Choose the Backup and Restore command from the menu.
2. Choose desired Backup Format.
3. Choose backup drive from the Backup device field.
4. Choose desired file.
5. Click the **Restore** button in the Backup Device field.

## 14.6 Chart

### *Chart backup*

The chart radar lets you keep a chart database identical both in the hard disk of the chart radar and the hard disk of the backup chart radar. If you want to make a backup of chart material to backup chart radar, open the Backup & Restore dialog box and do the following:

1. Choose file category
2. Choose Drive for backup of chart radar at Drive in the Backup Device window.
3. Click the **Backup** button.



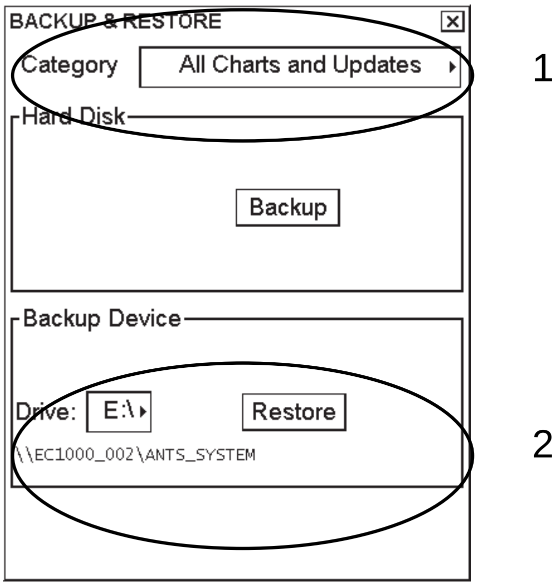

**Note:** To copy charts between chart radar workstations, it is recommended that you use the Restore function instead of Backup. For use of Backup, see the illustration below for when it is possible to use the Backup function.

After the backup has been completed, the hard disk content of the backup chart radar is identical with backup chart radar. However, the backup chart radar doesn't automatically start to use possible new material. To do this, open the Chart menu and select System>Refresh Charts after backup from the menu.

### *How to read chart material*

The chart radar lets you keep a chart database identical both in the hard disk of the chart radar and the hard disk of backup the chart radar. If you want restore a backup of some chart material from the backup chart radar, open the Backup and Restore dialog box and do the following:

1. Choose file category.
2. At Drive in the Backup Device window, choose the drive where backup chart radar is stored. Then, click the **Restore** button.




**Note:** After the restore has been completed, the hard disk content of the backup chart radar is identical with backup chart radar. However, the backup chart radar doesn't automatically start to use possible new material. To do this, open the Chart menu and select System>Refresh Charts after backup from the menu.

# 15. Navigation Sensors

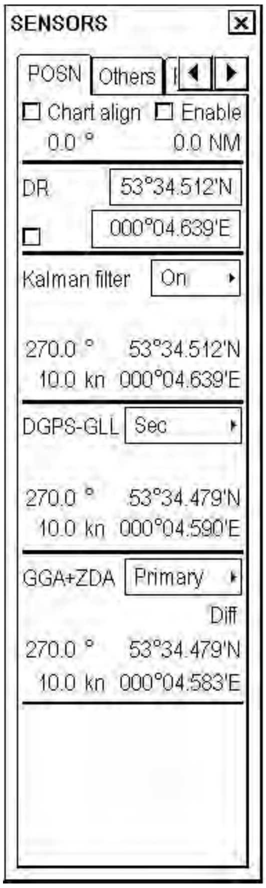
## 15.1 How to Select Navigation Sensors

The operator can choose navigation sensors to use for navigation and view their current values on the Sensors dialog box. To access this dialog box, put the cursor on the Position field in the information area then push the right button.

Checkbox status shows whether a sensor is used for integrated navigation or not. If there is no value shown for a sensor this means that the sensor is not valid. Note that the content of these pages depends on sensors that are in use on the ship.

### 15.1.1 Sensors dialog box description

#### *SPD/CRS (Speed/Course) page*




**Manual speed:** If checked, user can enter value (kn) for speed.

**Note:** This is used only if there are no other speed or SOG sensors chosen.

**Log:** If checked, a log is used as water speed source.

**Note:** If you have a dual-axis doppler log that can measure both water and bottom track, then installation parameters can be set to receive water tracking as log device.

**Dual log (water):** If checked, a dual log is used as speed and course source. "(water)" is used to indicate that this information is from water track of dual log.

**Dual log (bottom):** If chosen, a dual log is used as speed and course source. "(bottom)" is used to indicate that this information is from bottom track of dual log.

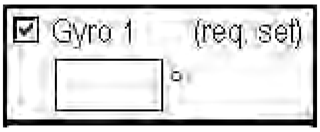
**Ref tgt:** Speed according to reference target.

**Gyro 1:** Heading source is a gyrocompass. "(mag)" means the source is magnetic heading. True heading source has no indication. If the source of Gyro1 is a gyro with synchro or stepper interface, the indication "(require set)" appears when you need to set a new initial value for the gyro.

**Rate gyro:** Heading source is a Rate of Turn gyro. "(calc.)" means the rate of turn is calculated from gyro movement.

**Setting initial value of Gyro 1:**

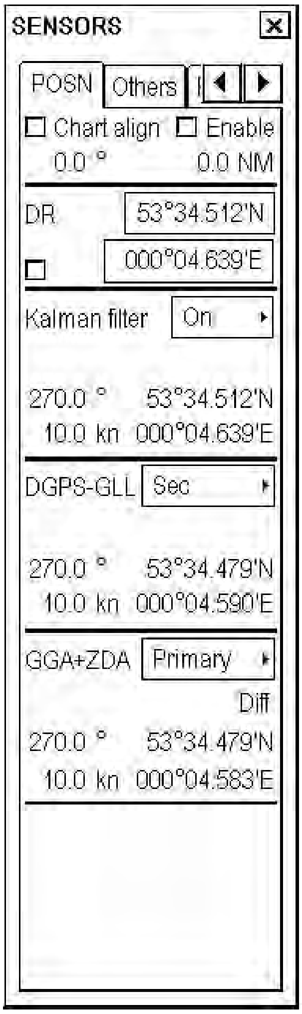
Initial setting of gyro1 is not necessary if it outputs serial data. However, if it is of synchro or stepper type, you will need to set initial gyro value. If gyro1 requires initial value, then the indication "(req. set)" is displayed. Use the scrollwheel to enter initial value. After you enter a value "req. set" disappears.



### *POSN (Position) page*

The field of a position sensor contains a label (here DGPS-GLL and GGA+ZDA) that indicates the name of the sensor; a status (primary/secondary/off) that indicates if the sensor is used or not; position at conning position and local datum; speed and course which has (MAG) if the course is referenced to magnetic north. A DGPS position sensor has additional text Diff, if differential signal is in use. Latitude and longitude values will appear in red and with additional text in the following conditions:

- Kalman filter has excluded the sensor from its estimated position. Additional text is "Excluded".
- Received position from position sensor is in another datum as set to be received in the chart radar. Additional text is "Datum".
- If position sensors have position discrepancy active. Additional text is "Discrepancy".




Position sensors have priority, which is indicated as "primary" or "secondary". Only one sensor can be primary while the others can be secondary or off. If a position sensor is changed from secondary to primary state and another position sensor was chosen as primary, then that sensor previously selected to primary state is then automatically selected to secondary state. When the position source is changed based on priorities and signal validity to another position source, then you get the alert "409 Position source change". Note that alert 409 is active only when the Kalman filter is off because the filter has its own process to calculate estimated position and in that process priority given by primary and secondary is not used.

If a DGPS is chosen as primary or secondary, and its status changes from "no Diff" to "Diff" or from "Diff " to "no Diff" the system generates the alert "727 DGPS pos. Source change" (alert numbers are from 727 to 732 depending on position receiver).

"Pri no alert" and "Sec no alert" can be chosen from the DPGS box if you want to disable the alert "727 DGPS pos. source change". These selections are intended for the area where the differential coverage is fading. One example is if you sail along coastline but you are so far away that the differential signal changes its status very often.

The system generates the alert "738 Datum mismatch" (alert numbers are from 738 to 743 depending on the position receiver) if output datum of a chosen position sensor (status other than Off) is changed from WGS-84 to another datum or if chosen position sensor does not send datum message. Additional text "datum" appears, in red. Further, lat/lon values for the position sensor turn red. If the position sensor is also used for system position, Kalman filter and your ship's position (Lat/Lon values and datum used) are indicated in red. If output datum of a chosen position sensor is changed from no datum message or another datum to WGS-84 and the operator has used the selection Primary or Secondary, then the system generates the alert "744 Datum change" (alert numbers are from 744 to 749 depending on position receiver).

**Note:** The ability to check datum of position is a relatively new feature for position receivers. It was introduced in standard IEC 61162-1 Ed2, published in July 2000. Only EPFS (for example GPS or DGPS) that has "IEC 61162-1 Ed 2 (2000-7)" indicated in their type approval certificate can support the ECDIS to detect datum mismatch.

The system generates the alert "407 Position discrepancy" if there is discrepancy in position. Together with this alert, the system shows the text "Discrepancy" in red in the Position page for a position sensor that has position discrepancy active.

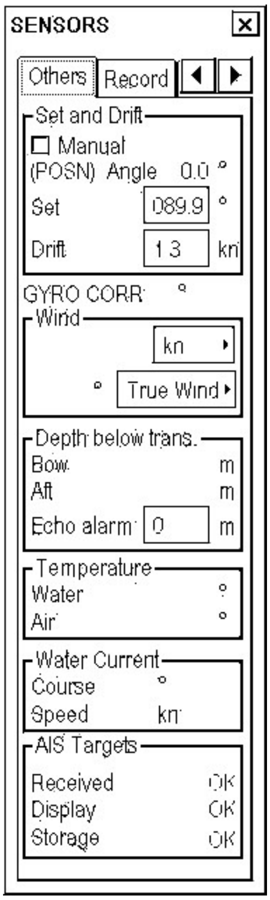
**Enable:** Check to align chart, using the "drag and drop" feature.

**Chart alignment:** Alignment is automatically chosen if the user has defined position offset by using the chart align feature. The offset values are given in nautical miles and degrees. If position alignment is used, the user is reminded of it every 30 minutes by the alert "411 ChartAlign: over 30 min".

**Dead rec:** The system automatically chooses dead reckoning if there are no valid and chosen position sources and if there are valid and chosen speed and course sources. If the system has chosen dead reckoning, then the user can enter a new position for the ship in the Lat and Lon fields.

**Kalman filter:** The Kalman filter calculates estimated position using all valid and chosen position, speed and course sensors. Choose On to activate this feature.

### *Others page*




**Set and Drift:** See description below.

**Wind:** Wind (True or North) speed (kn or m/s) and direction are displayed. Note that true wind is wind relative to own ship heading. For further details, see section 15.8 Wind Sensor.

**Depth below trans:** Depth from hull at bow and aft to bottom. A depth alert value may be entered to alert you to

**Temperature:** Water surface temperature.

**Water current:** Tide at current position.

**AIS targets:** Status of AIS data.

**Set and drift:** Check the Manual box to manually set speed and course of drift.

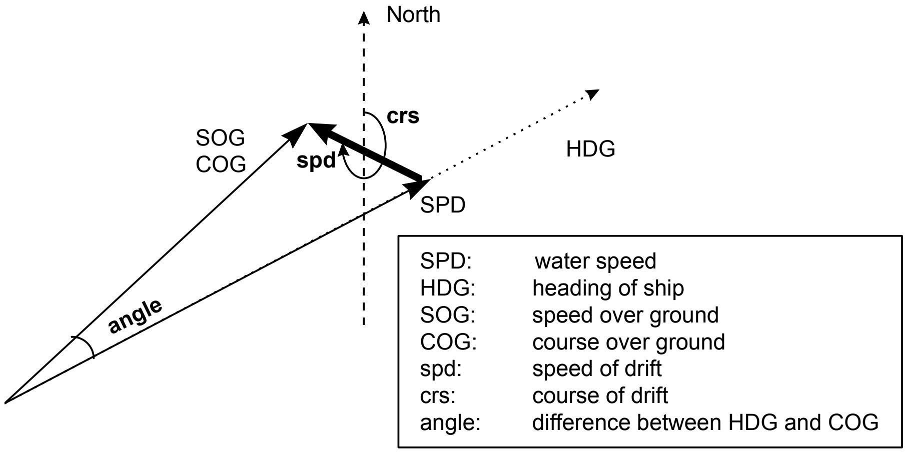
Note that you can choose manual drift only if there are no automatic sources for SOG and COG. In other words, you have neither a dual-axis log nor any position receiver available.

Angle = Difference between heading and COG

Drift = Speed component of the drift vector

Set = Course component of the drift vector

*Vector defined by (SOG and COG) is equal to vector sum of vectors defined by (SPD and HDG) and (set and drift).*

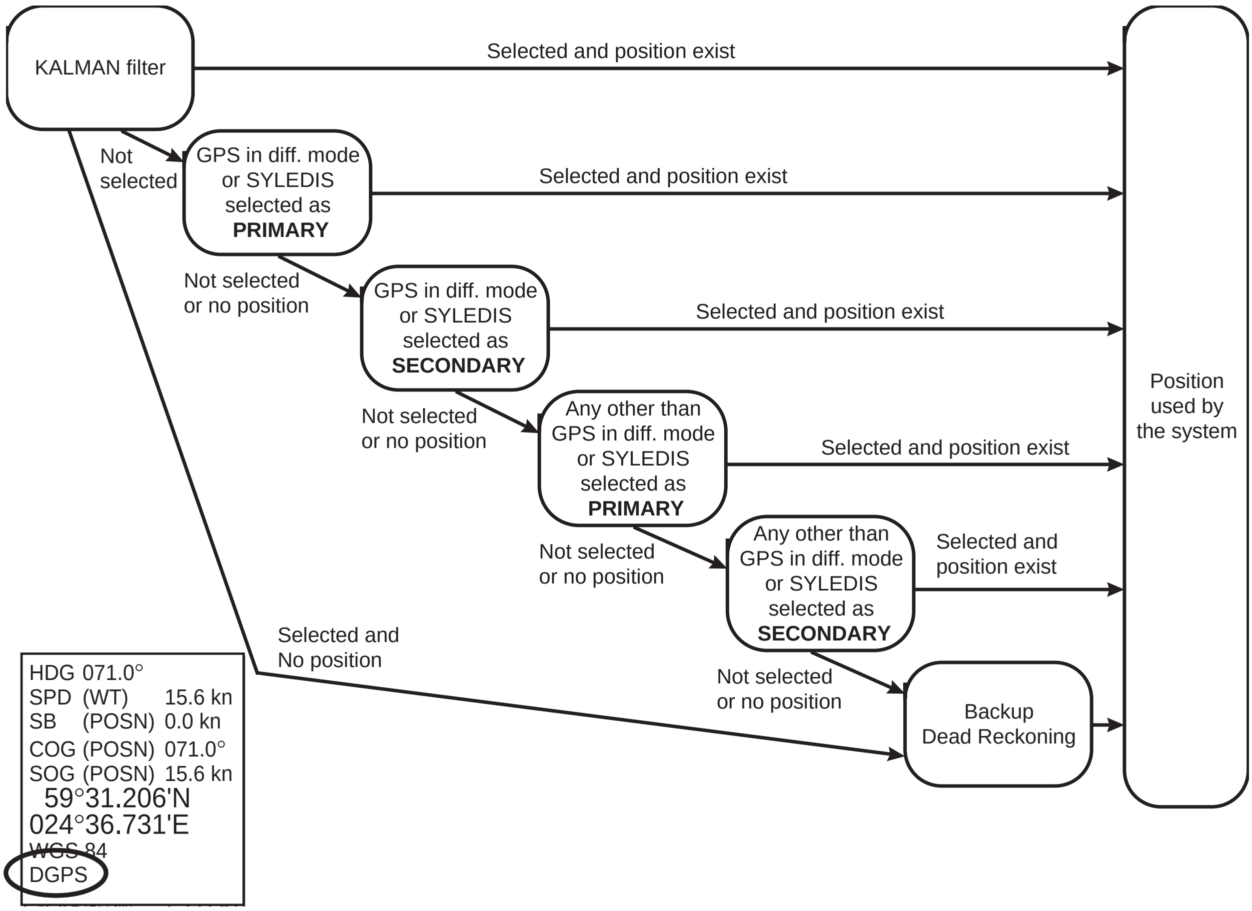



## 15.2 Source of Position

The figure below shows how source for position is chosen. The Kalman filter uses all position sensors that have either primary or secondary as input for its calculation. DGPS and SYLEDIS position sensors are considered more accurate than other position sensors.

The latitude and longitude position is shown at the upper right corner on the chart radar display, and in the example below the position source is DGPS. Other indications that may be displayed in the position area are as follows:

- **NO POSIT:** Appears (in red) when no dead reckoning sensors are chosen and valid.
- **DEAD REC:** Shown (in red) when position source is dead reckoning.
- **DGPS, GPS: LORAN, DECCA** or **SYLEDIS:** Name of position source.
- **LOST DGPS:** Shown (in red) when the user-selected DGPS device has lost the DGPS signal.
- **FIL LOST DGPS:** Shown (in red) when the Kalman filter is in use and the user-selected DGPS device has lost the DGPS signal.
- **FILTER HIGH:** Shown when the position source is the Kalman filter with high-precision position sensor.
- **FILTER:** Shown when position source is the Kalman filter without high-precision position sensor.
- **BAD FILTER:** Shown (in red) when position source is the Kalman filter and the filter has excluded at least one of the chosen sensors because of poor accuracy.




If the system changes the source of position because of lost sensor data or the differential mode is changed on a DPGS device, the system immediately generates the alert "409 Position source change". If the Kalman filter is used, the system generates the alert "410 Filter: Pos source change" after a time out period of 90 sec.

If a chosen DGPS sensor changes its operation mode and its status is primary or secondary, then the system generates the alert "727 DGPS pos. source change" (727 for first sensor, 728 for second, etc.). These alerts are not generated if the operator has chosen Pri no alert or Sec no alert.

If source of position includes a position sensor that is in datum mismatch condition, the latitude, longitude and chosen datum are displayed in red.

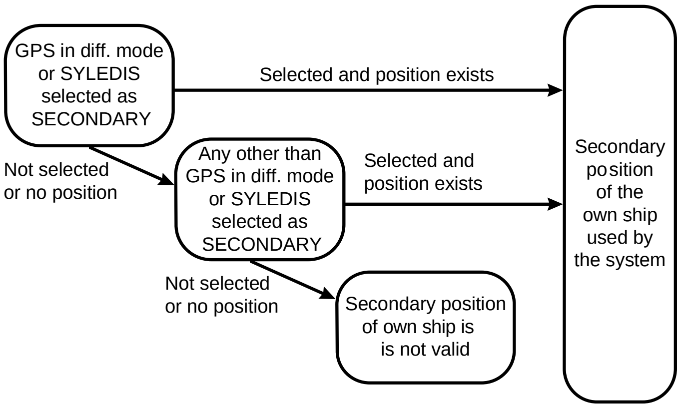
## 15.3 Primary and Secondary Positions of Own Ship

The system has three different positions for own ship: System position, primary position and secondary position:

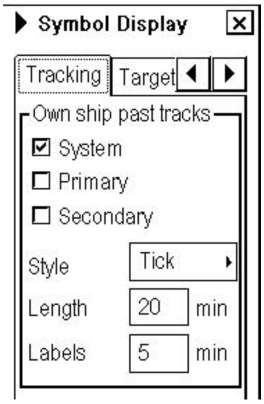
- System position: Used for navigation and steering. See section 15.2 Source of Position.
- Primary position: Position generated by position source chosen as primary position source.
- Secondary position: Position generated by position source chosen as secondary position source.

The position source for primary position of own ship is chosen either as Primary or as Pri no alert on the Position page of the Sensors dialog box.

The position source for secondary position of own ship is chosen either as Secondary or as Sec no alert on the Position page of the Sensors dialog box. Secondary position of own ship is not available as latitude/longitude value for the user.

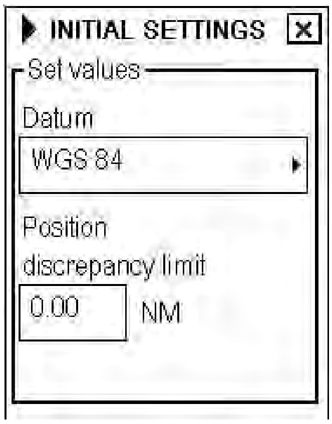



System, primary and secondary positions of the own ship may be plotted on the chart radar display with the Past tracks feature. You can control their visibility from the Tracking page of the Symbol Display dialog box, shown right. In this example, past tracks are plotted using your ship's system position.




## 15.4 Position Discrepancy Alert

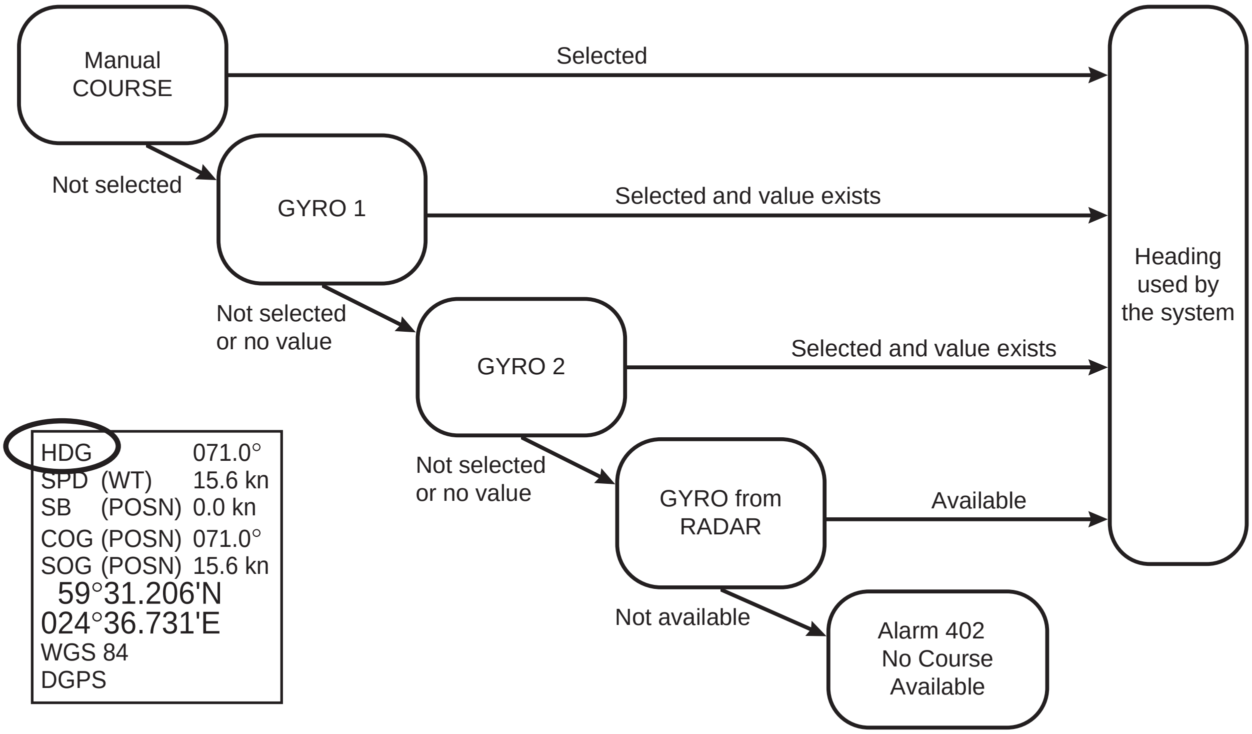
You can activate the alert "407 Position discrepancy" from the Initial Settings dialog box. The alert is active between primary position and any secondary positions. Note that the alert is also effective between own ship position and any positions, since chart radar compass position discrepancy between position used by system (own ship position) and any individual position sensor selected as primary or secondary source of position. To deactivate the alert set limit as 0.00.



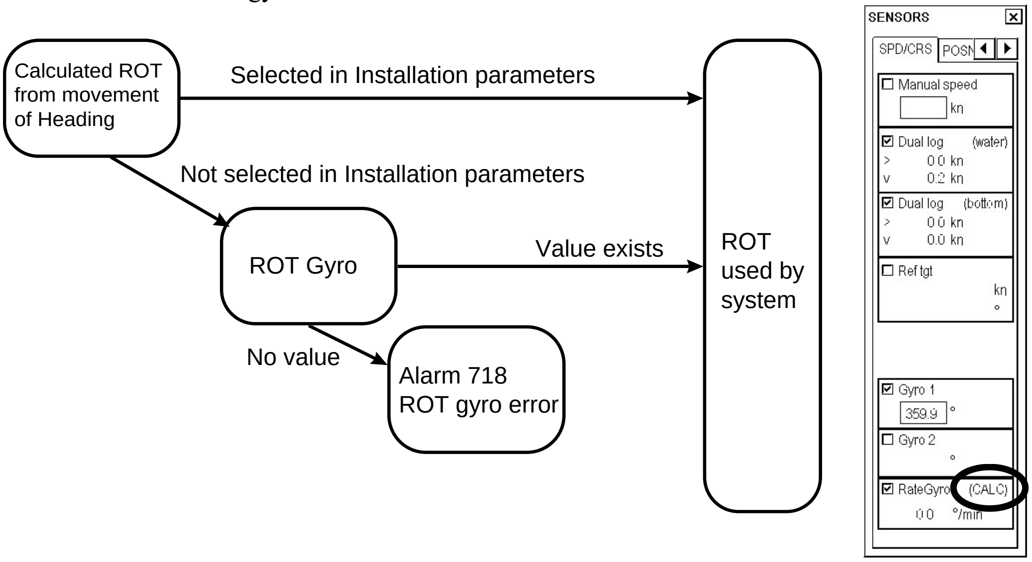
## 15.5 Source of Navigation Data

The figure below shows how various sources of navigation data are chosen. "SOG, COG" is speed over ground and course over ground, respectively. "Speed" is speed over water, "Drift" is the difference between speed over water and speed over ground. Docking speed components are bow speed (transversal), stern speed (transversal) and center speed (longitudinal).

Heading used by the system is shown at the upper right corner of the chart radar display. In the example shown below, heading is received from a gyrocompass and it is shown without additional text, meaning the value is referenced to true North. Additional gyro-related text that may appear are "(mag)" if the value is referenced to magnetic North, "(man)" if the value has been manually entered; or "(corr)", which is displayed in red, if the value includes gyro correction.



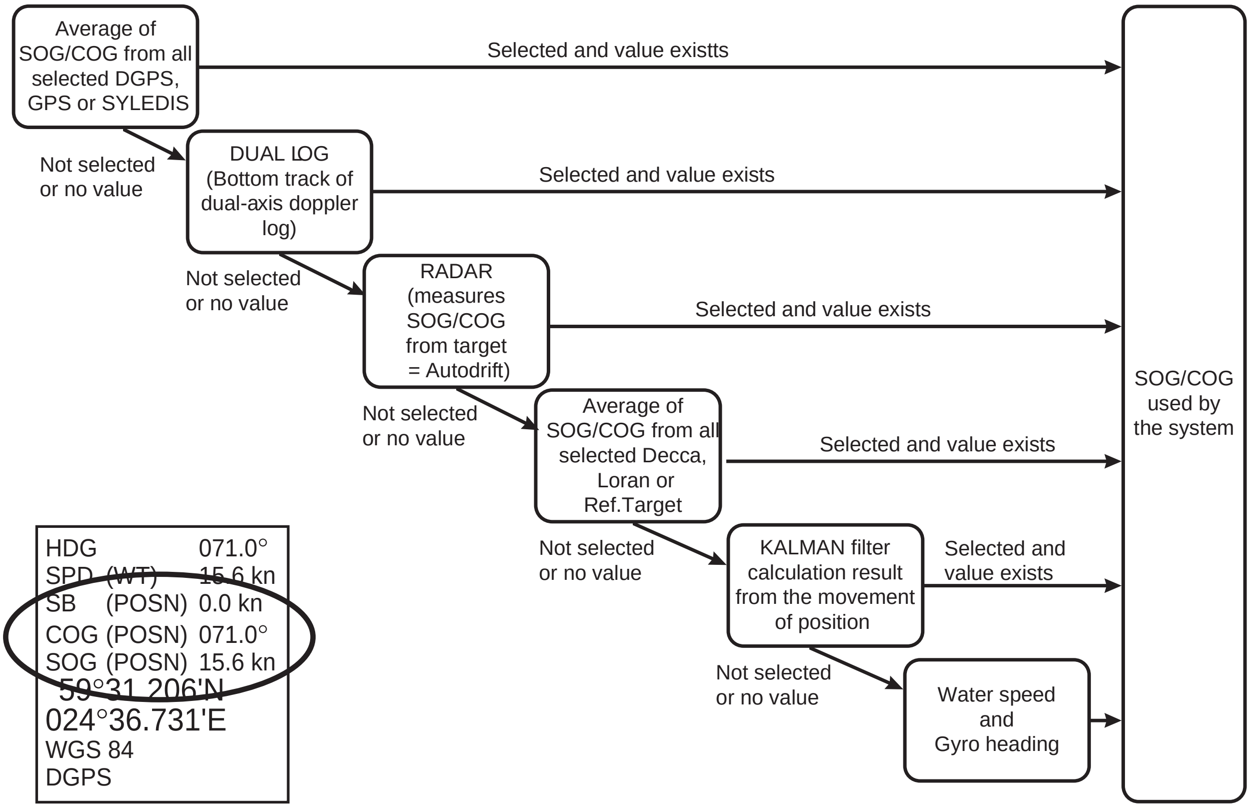

ROT used by the system is shown in the Speed/Course page of the Sensors dialog box. The Rate Gyro field shows the text "(calc.)" when the system calculates ROT from movement of heading. No text is shown when the value is received from an ROT gyro.



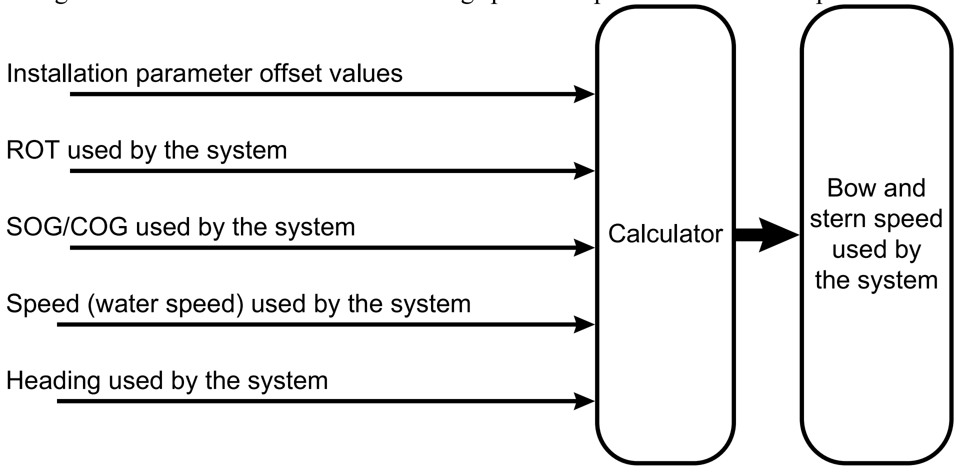
SOG/COG used by the system is shown at the upper right corner of the Chart Radar display. In the example below, COG and SOG are from chosen position sensors and this is indicated with the text "(pos)". Other text that denotes SOG/COG source are

(BOT): Bottom tracking dual-axis log
(CALC): Speed calculated from SOG
(WT): Water tracking log
(RDR): Mixed sources of COG and SOG in the connected radar
(POSN): Average of chosen position sensors
(FILTER): Kalman filter
(MAN): Manual entry

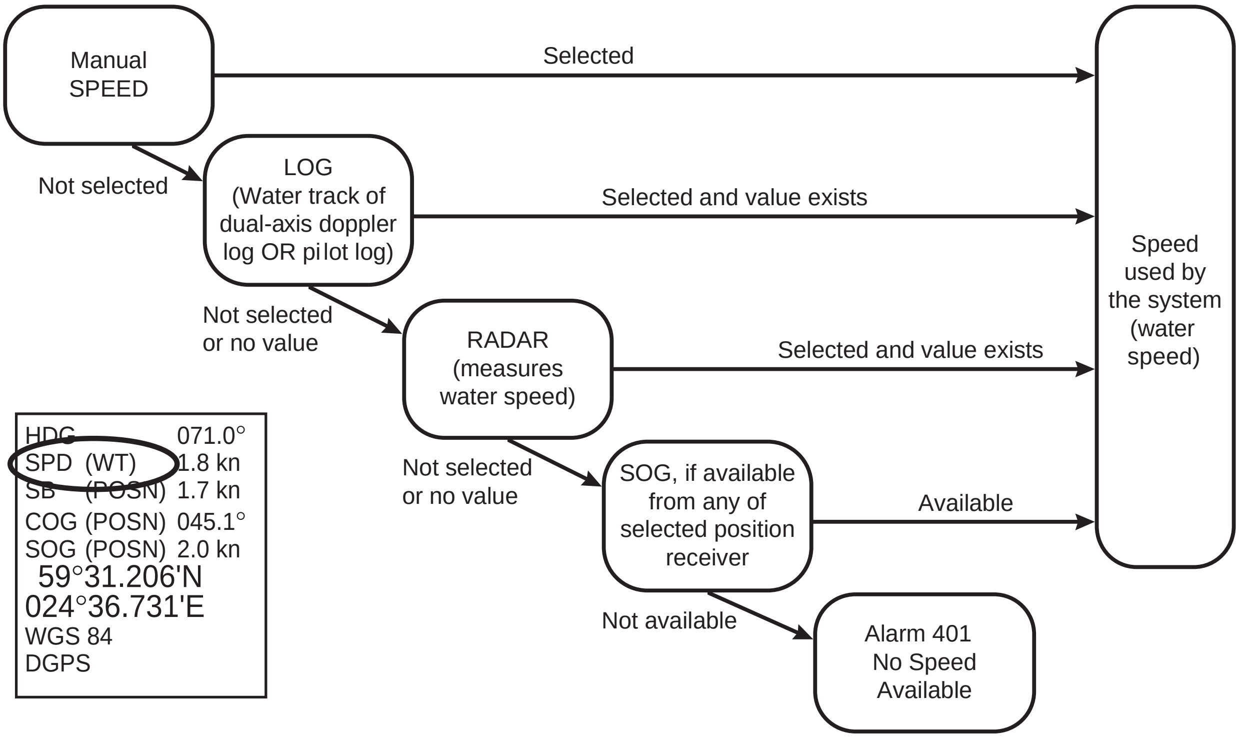
Note that (pos), (bot), (wat) and (man) could come from direct interfaces of the system or from the connected radar.




The figure below show the source of docking speed components used for the predictor.

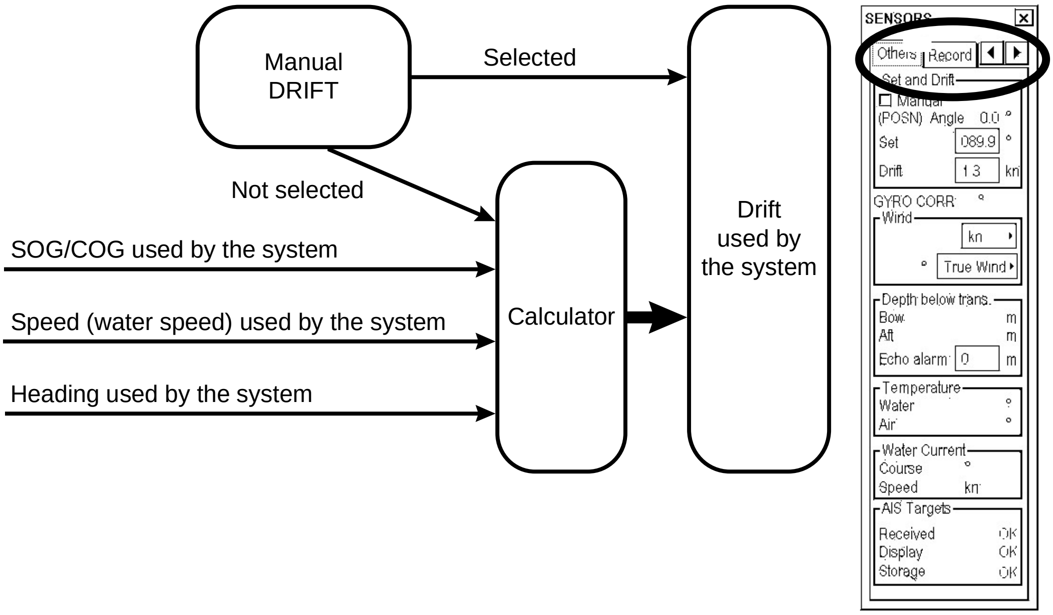


The figure below shows the source of water speed is used for drift calculation.




Drift used by the system is shown in the Other page of the Sensors dialog box. In the example below, set and drift have been entered manually since the Manual box is checked. Other text that may appear to show source of set and drift are

(LOG): Log or dual-axis log
(POSN) Position sensor
(FILTER): Kalman filter
(MAN): Manual entry..



### *Alert related to SOG, COG, speed, heading, ROT, drift and docking speed components*

It is possible that the operator has not chosen any speed or heading sensors, or that the chosen sensors do not have any valid values. This kind of a situation is critical for the system, because it cannot even perform dead reckoning. When no speed source is available, the system generates the alert "401 No speed available". When no heading source is available the system generates the alert " 402 No heading available".

The system may find that SOG and/or COG from the sensors are unreliable, at which time it generates the alert "413 SOG&COG unreliable". Note that the source of SOG and COG is not only speed and course sensors, but the source can also be position-fixing equipment.

Verify and choose valid sensors in the SPD/CRS and POSN pages of the Sensors dialog box for SOG and COG used by the system.

## 15.6 Kalman Filter

The chart radar has an automatic multi-sensor Kalman filter for position. The filter can calculate estimated position using all operative position sensors.

To view position sensor status, put the cursor on the Position indication, confirm that Sensors appears in the mouse functions area then push the right mouse button.

Operator can manually include or exclude sensors. Remaining sensors (= sensors with any selection other than OFF) are included in the filter processing. The purpose of this filter is to continuously monitor the position given by each individual sensor to determine if the sensor is reliable or not. Also chosen gyro and log sensors are included into this analysis. The filter knows the behavior of different types of sensors (Loran, Decca, GPS, DGPS, etc.). The result of the processing is a smoothed position that is used as final position of the ship. The filter eliminates all "position jumps" in the final position even if there is a position jump in a sensor. (A position jump is caused by line change in Decca, loss of differential signal with DGPS, etc.)

The filter can be selected or deselected by switching it ON or OFF. When switching filter state from ON to OFF, new start position of the filter is set as an average value of the enabled sensors (sensors with any selection other than OFF). Change the filter state from OFF to ON, and the filter continues processing from current position.

When the filter is chosen, alerts are generated if the system does not have a valid position available. No alerts are generated for position jumps of the position sensors chosen to be used with the filter as long as the filter is able to estimate a reliable position based on chosen position sensors. If there is a change in the availability of the sensor chosen with the Kalman filter and if the filter cannot continue the same level of position accuracy, then the system generates the alert "410 Filter: Pos source change". This change of available sensor may or may not affect the operation of the filter.

The filter requires at least one position sensor and one course sensor (i.e., gyro) chosen and valid in order to operate. The filter has one main alert "400 Filter: Pos unreliable". This alert means that the filter is not able to calculate the position from the connected sensors. This can happen if there is only one position sensor connected and the position generated by it becomes unreliable or if there are more position sensors but they are deviating too much. Alert can appear also if the speed/course sensor (Log or Gyro) is found to be unreliable. Note that the filter indicates unreliable position sensor by showing position in red.

If the filter is used without automatic route steering then, in case of alert 400, only the filter itself is set in the OFF state. After generating the alert 400, the system will use its normal method to choose position source from available sensor. Normally, this causes a jump in the position. After the alert 400 is generated, the operator should evaluate which sensor caused the problem. Disable the bad sensor then turn the filter ON again.

The Kalman filter is designed to support automatic route steering and thus it requires that you have some speed. If the speed is less than the value set in the installation parameters (for example 4 kn), the system generates the alert "408 Filter: Speed below 4 kn". If you don't use automatic route steering, the system also chooses the filter as OFF after generating the alert 408. With automatic route steering the system keeps the filter chosen, but repeats alert 408.

The system can check that each chosen position sensor is within position discrepancy limit set by the operator. (For further details, see section 15.4 Position Discrepancy Alert.) If a position sensor has position discrepancy active, it is automatically excluded from the Kalman filter. This feature enables the operator to control how much discrepancy there can be between the Kalman filter position and any position sensor.

### 15.6.1 Position alignment

The position alignment feature functions to fine tune ship's position by using radar, radar echo target and chart radar chart material.

If position alignment is in use, the chart radar will generate the following alert every 30 minutes to remind the user to align position: "411 ChartAlign: over 30 min".

### 15.6.2 Position alignment by means of the chart radar

If the radar echo targets' symbols are not positioned correctly, there is either position error or gyro error or some combination of these errors.

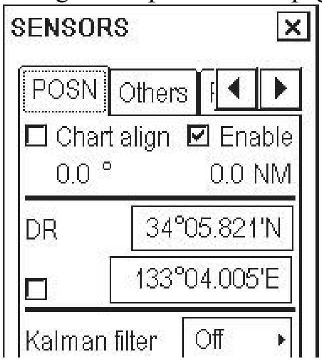
Position may be aligned on the chart radar display by moving own ship position or by moving Radar target position. Moving is done by dragging and dropping own ship symbol or Radar target to desired location. Drag and drop means that you place the object on desired location by rolling the trackball while pressing and holding down the left button then "anchoring" the object by releasing the left button.

**Note:** If the radar is on the chart radar display when position alignment is done, then

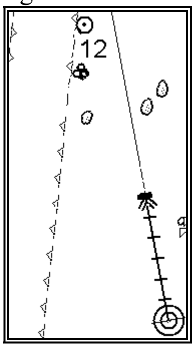
- Mode of radar is temporarily changed to "Radar over Chart".
- Chart radar temporarily uses radar color also for own ship and TTs symbols.

To align position, do the following:

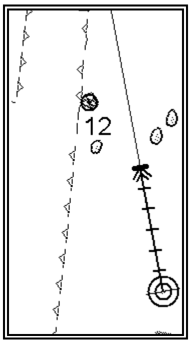
1. Choose suitable radar target manually for tracking.
2. Put the cursor on the position indication in the information area then push the right button to display the Sensors dialog box. Open the Posn page, then check Chart Align.




3. Use the trackball and the left button to drag and drop a symbol or suitable chart detail on a radar target. See figures below.



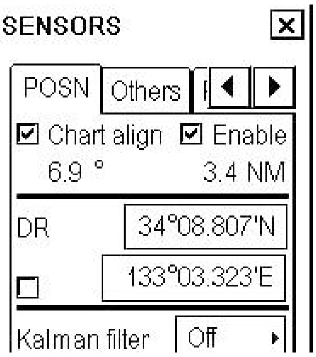
*Before position alignment*



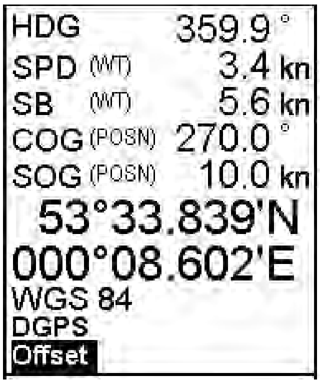
*After position alignment*

4. If the position source is dead reckoning, the position set with chart alignment is the new start position for dead reckoning. In this case, there is no offset and the text indication OFFSET does not appear. If the position source is something other than dead reckoning, then the indication OFFSET is displayed at the upper part of the information area. Also the range and bearing of the offset are shown in the Posn page of the Sensors dialog box.

You can see range and bearing of the offset in the Posn page of the Sensors dialog box.



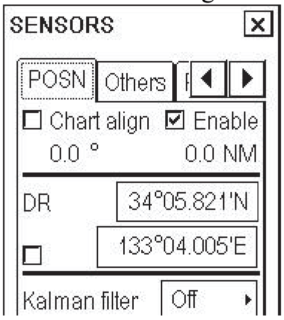

The indication Offset appears in reverse video on the chart radar display.



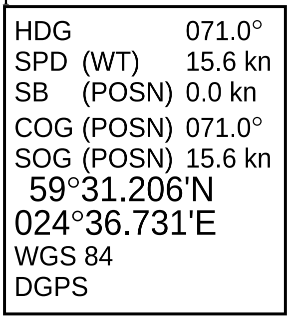

## 15.6.3 Resetting position alignment

To reset position alignment, proceed as follows:

1. Open the Sensors dialog box then open the Position page.
2. Uncheck "Chart Align".




3. Check that the indication Offset is not shown in the upper part of the information area, to the right of the position source indication.



# 15.7 Gyro Error Correction

Typical gyro error sources are installation error, speed/latitude error and dynamic settling error. Typically you detect gyro error on a user chart superimposed on the TT picture, on TTs drawn on the chart radar display or on radar drawn on the chart radar display.

Gyro error correction is used to remove the difference between the chart north and the gyro north.

Gyro error can be corrected totally or partially in the gyro compass system itself. Many gyro compass systems have automatic speed/latitude corrector, which may use automatic or manual input for speed and latitude. Some gyrocompass systems also include correction for dynamic settling error.

Automatic gyro error correction based on tabled speed/latitude correction can be used, if the gyrocompass itself does not make any corresponding correction.

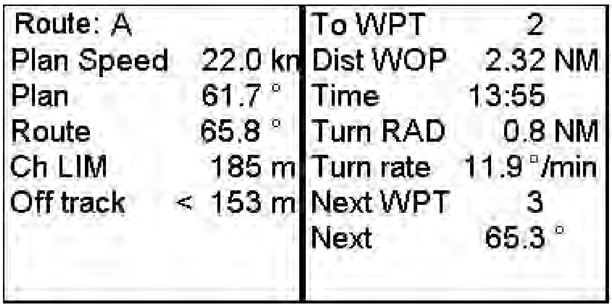
Gyro error compensation can be used to:

- Correct user chart on Radar screen
- Correct TT positions on chart radar display
- Correct radar drawn on chart radar display
- Compensate courses used in route monitoring and automatic route steering.

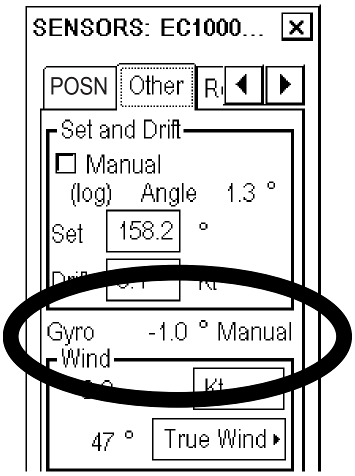
If you have enabled Gyro error correction (see the next page) and if this correction has modified the value of the own ship heading, then this condition is always visible in the information area. Red "(corr)" means the gyro value has been corrected.

| | | |
|---|---|---|
| HDG | | 071.0° |
| SPD | (WT) | 15.6 kn |
| SB | (POSN) | 0.0 kn |
| COG | (POSN) | 071.0° |
| SOG | (POSN) | 15.6 kn |
| 59°31.206'N | | |
| 024°36.731'E | | |
| WGS 84 | | |
| DGPS | | |

If you have enabled both Gyro error correction from ship parameters and Gyro error compensation from route parameters, then Plan and Next in the information area display show compensated values, as shown in the example at right. Also, course to steer (used by automatic route steering) is compensated in this case.



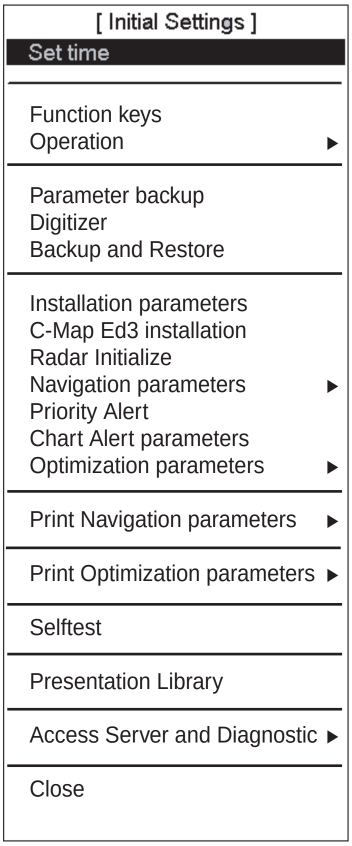

The current value of gyro correction and its method are displayed in the Other page of the Sensors dialog box as shown in the example at right. "Table" means speed/latitude table is the source for gyro correction; "Manual" indicates manual entry of gyro correction.

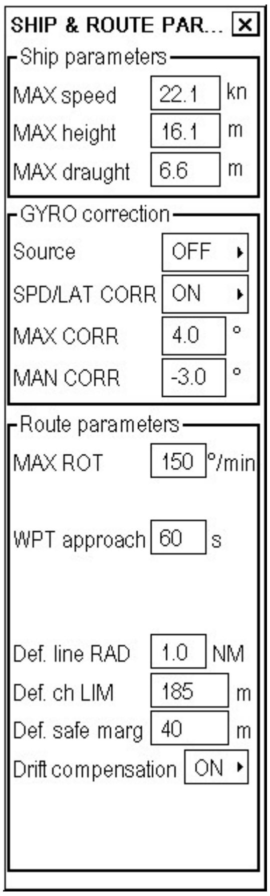


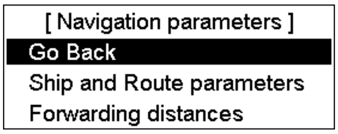
### 15.7.1 How to enable gyro error correction

To enable gyro error correction, which is effective for radar, chart radar and route steering, do the following:

1. Spin the scrollwheel to display Menu/Info/Chart Menu in the guidance area, push the left button, choose Initial Settings from the menu then push the scrollwheel.
2. Put the cursor on the triangle in the Initial Settings dialog box, choose Navigation Parameters from the menu then push the scrollwheel.
3. Choose Ship and Route parameters from the sub menu then push the scrollwheel.
4. Put the cursor in the Source box in the Gyro error correction field, spin the scrollwheel to choose Auto then push the scrollwheel. This enables automatic gyro correction.




#### *Gyro correction related settings in Ship parameters field in Ship and Route parameters dialog box*

<u>**Gyro correction field**</u>

**Source:**

- **Off:** Disables any gyro error correction.
- **Auto:** Enables automatic gyro correction based on tabled speed/latitude.
- **Manual:** Enables manual gyro error correction, in the Manual gyro correction field.

**Gyro spd/lat error:** Chooses the automatic gyro error compensation based on tabled speed/latitude correction. Gyro error correction must be set for Auto for Gyro spd/lat error to be effective.

**Max corr:** Sets limit for maximum correction allowed. Typical value is 3 degrees.

**Manual corr:** Adjusts gyro error manually. Note that to enable this function you have to switch Gyro error correction to the Manual position.

## 15.8 Wind Sensor

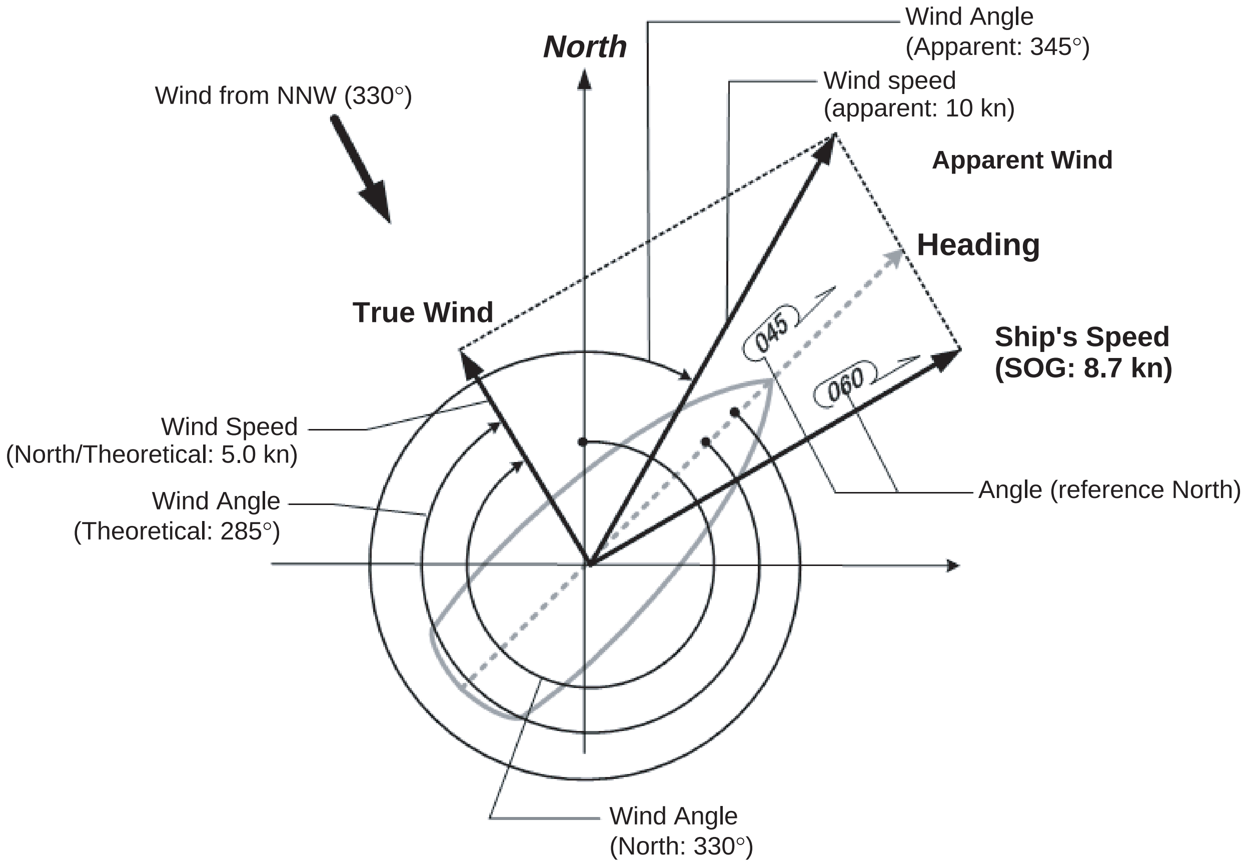
chart radar can display and output wind data in the following three formats:
**Apparent:** Windmeter-measured wind speed and direction.
Wind angle reference: Heading
**North:** True wind angle, true wind speed
Wind angle reference: True North
**Theoretical:** True wind angle, true wind speed
Wind angle reference: Heading

The illustration below shows wind speed and direction with given ship data.

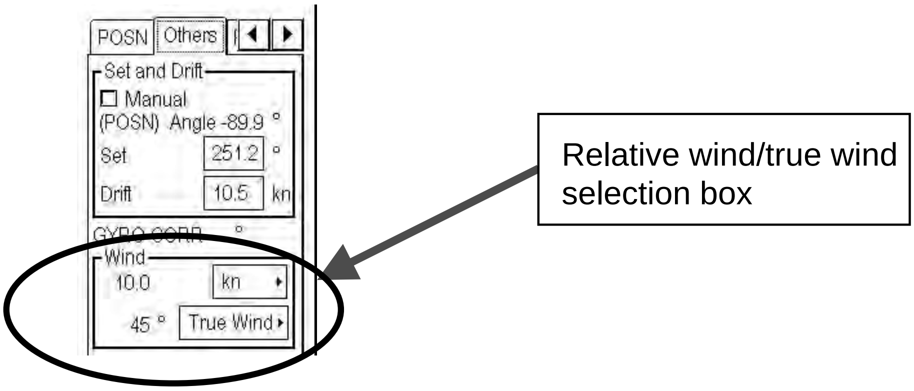
The wind values are as shown below.

Ship information:
COG: 60° SOG: 8.7 kn
Heading: 45°

| | Wind angle | Wind speed |
|---|---|---|
| Apparent: | 345° | 10 kn |
| North: | 330° | 5 kn |
| Theoretical: | 285° | 5 kn |



True wind or Relative wind may be selected from the Other dialog box in the Sensors menu.




### 15.8.1 Installation parameter for wind sensor

There are installation parameters for a wind sensor:

- Source of True wind (Setting for inputted serial data)
- Display format (Relative wind, true wind)
- Output format to TT (output format to TT)

The tables that follow describe the above-mentioned parameters. Greyed options are default settings.

***Source of true wind***

| Option | Description |
|---|---|
| Receive (R)elative/Apparent Wind and Calculate True Wind | R(Relative) is extracted from the MWV sentence, read as Apparent data and North and Theoretical are calculated. |
| Receive (T)heoretical Wind(HDG) and Calculate True Wind | T(True) is extracted from the MWV sentence, read as Theoretical data and North and Apparent are calculated. |
| Receiver (T)rue Wind(North) and use it directly | T(True) is extracted from the MWV sentence, read as North data and Apparent and Theoretical are calculated. |

***Display format***

| Option | Option in Sensor dialog box | |
|---|---|---|
| | Rel wind | True wind |
| Display Rel(=Theoretical) or True(=North) | Theoretical | North |
| Display Rel(=Apparent) or True(=North) | Apparent | North |
| Display Rel(=Apparent) or True(=Theoretical) | Apparent | Theoretical |

***Output to radar***

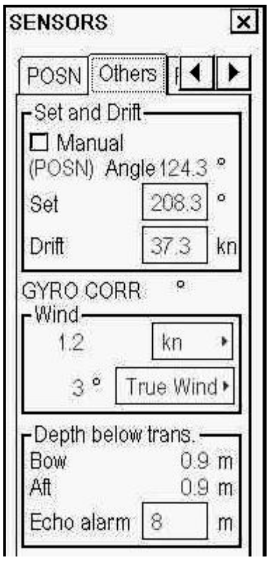
| Option | Description | |
|---|---|---|
| Output T(=True/North) only | The reference field of the MWV sentence is T(True) and North data is output. | |
| Output T(=True/Theoretical) only | The reference field of the MWV sentence is T(True) and Theoretical data is output. | |
| Output R(=Rel/Apparent) only | The reference field of the MWV sentence is R(Relative) and Apparent data is output. | |
| Output R(=Rel/Theoretical) only | The reference field of the MWV sentence is R(Relative) and Theoretical data is output. | |
| The output sentence of the items below changes according to setting of Rel Wind and True Wind. | Option on Sensor dialog box | |
| | Rel Wind | True wind |
| Output T(=True/North) or R(=Apparent) | The reference field of the MWV sentence is R(Relative) and Apparent data is output. | The reference field of the MWV sentence is T(True) and North data is output. |
| Output T(=True/North) or R(=Theoretical) | The reference field of the MWV sentence is R(Relative) and Theoretical data is output. | The reference field of the MWV sentence is T(True) and North data is output. |
| Output T(=True/Theoretical) or R(=Apparent) | The reference field of the MWV sentence is R(Relative) and Apparent data is output. | The reference field of the MWV sentence is T(True) and Theoretical data is output. |

# 15.9 Depth Sensor

The depth output from a depth sensor (for example, echo sounder) is shown on the Other page in the Sensors dialog box.

The content of the Other page in the Sensor menu depends on sensors connected.

In this example there are two transducers (bow and aft) installed.




The system displays depth value as depth below the transducer. If required, you can activate an alert, in the Echo alert box, based on the depth below the transducer. If the measured depth is less than the set at Echo alert, the system generates the alert "320 Depth below limit".

## 15.10 Sensor-related Alerts

The following alerts, which are not described elsewhere, are related to sensors.

"**355 Radar Comm. Error":** Lost connection to radar 1. As a consequence the system loses TTs and speed/course available from radar.

"**356  Radar Comm. Error":** Lost connection to radar 2. As a consequence the system loses TTs and speed/course available from radar.

"**357 Radar Comm. Error":** Lost connection to radar 3. As a consequence the system loses TTs and speed/course available from radar.

"**358 Radar Comm. Error":** Lost connection to radar 4. As a consequence the system loses TTs and speed/course available from radar.

"**371 Source Radar changed":** Lost connection to the radar that is the source TTs and speed/course information. Then, if other radars exist, the system chooses one of them as the new source of TTs and speed/course information and the system generates alert 371.

"**701 B-Adapter Error":** Lost connection to B-Adapter, which is an interface to various navigation sensors.

**"702 Engine Control Comm Error :** Lost connection to engine control, which could be an interface to various navigation sensors.

**"705 Gyro Error":** Lost connection to gyro1 sensor.

**"706 Gyro Error":** Lost connection to gyro2 sensor.

**"708 Log Error":** Lost connection to log sensor.

**"709 Dual Axis Log Error":** Lost connection to dual-axis log sensor.

**"710 Echo Sounder Error":** Lost connection to echo sounder sensor.

**"711 Wind Sensor Error":** Lost connection to wind sensor.

**"712 Position Eq Error":** Lost connection to position sensor number 1.

**"713 Position Eq Error":** Lost connection to position sensor number 2.

**"714 Position Eq Error":** Lost connection to position sensor number 3.

**"715 Position Eq Error":** Lost connection to position sensor number 4.

**"716 Position Eq Error":** Lost connection to position sensor number 5.

**"718 ROT gyro error":** Lost connection to ROT gyro sensor.

**"721 Radar system Error":** Displayed if radar number 1 reports internal failure.

**"722 Radar system Error":** Displayed if radar number 2 reports internal failure.

**"723 Radar system Error":** Displayed if radar number 3 reports internal failure.

**"724 Radar system Error":** Displayed if radar number 4 reports internal failure.

# 16. Recording Functions

The chart radar records various voyage-related items like movement and position of own ship and dangerous radar targets (from Radar). These items are recorded in the following logs:

**Voyage log:** Records entire voyage, i.e., a sailing of a route from first point to the last.

**Details log:** Records position, speed and course once every minute.

**Danger Target log:** Records dangerous TT data.

**Chart Usage log:** Records information of used charts in display.

**Alert log:** Records alerts generated by the system.

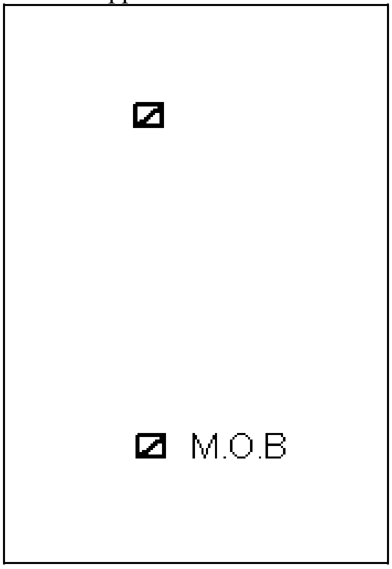
The user may print the contents of any log.

## 16.1 Events and Man Overboard Functions

The Events and Man Overboard (MOB) functions are accessed with the mouse. Spin the scrollwheel to display Event/Info/MOB in the guidance area then push the left or right button as appropriate.

**Left button (Event):** Records an event to the logbook. You can also write a comment for this event. It is displayed only in the electronic chart area if Events is chosen for display in the Tracking page of the Symbol Display dialog box.

**Right button (MOB):** Records MOB position to the logbook. Position of this event is also displayed on the chart as an orange square with a diagonal line running through it, as shown below. You can add a comment (up to 48 alphanumeric characters) to an MOB mark by selecting the mark then pushing the left button. The Event Description window appears. Enter comment and click the **OK** button.




The chart radar can display Events and MOB. These events are also recorded into the Voyage log.

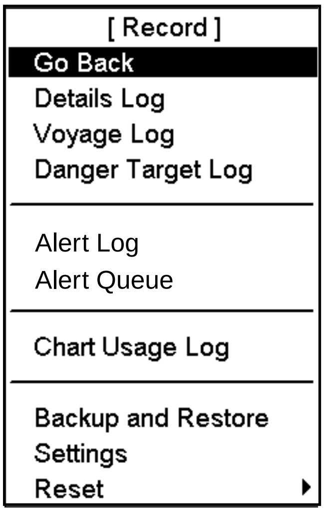
# 16.2 Details Log

The details log contains voyage information of the last 12 hours. Various information is recorded in the details log once per minute.

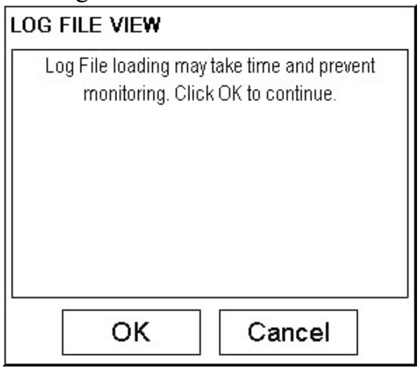
- Date and time
- Position of own ship as output by chosen navigator.
- Alignment (range, bearing) values, if used.
- Speed over ground and course over ground.
- Heading.
- Gyro correction value, if used.

## 16.2.1 How to view the details log

To open the details log, do as follows:

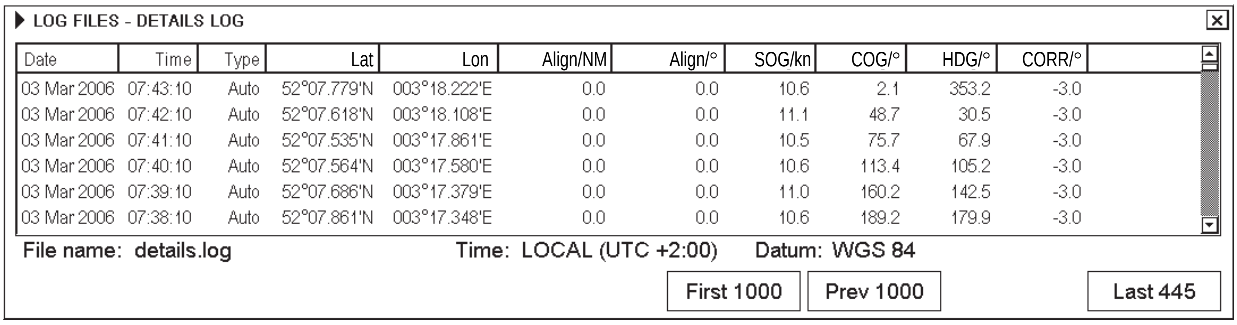



1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Record from the menu then push the scrollwheel.
3. Choose Details Log from the menu then push the scrollwheel.
4. The following window appears. Confirm that you want to open the log by clicking the **OK** button. Otherwise click the **Cancel** button.




The system will start viewing program of log.

You can print the entire log or a desired part. To change print font size, put the cursor on the triangle and choose desired font size. To print the log, click the **Print Log** button. To print whole log, select **Print All** from the menu.


LOG FILES - DETAILS LOG

| Date | Time | Type | Lat | Lon | Align/NM | Align/° | SOG/kn | COG/° | HDG/° | CORR/° |
|---|---|---|---|---|---|---|---|---|---|---|
| 03 Mar 2006 | 07:43:10 | Auto | 52°07.779'N | 003°18.222'E | 0.0 | 0.0 | 10.6 | 2.1 | 353.2 | -3.0 |
| 03 Mar 2006 | 07:42:10 | Auto | 52°07.618'N | 003°18.108'E | 0.0 | 0.0 | 11.1 | 48.7 | 30.5 | -3.0 |
| 03 Mar 2006 | 07:41:10 | Auto | 52°07.535'N | 003°17.861'E | 0.0 | 0.0 | 10.5 | 75.7 | 67.9 | -3.0 |
| 03 Mar 2006 | 07:40:10 | Auto | 52°07.564'N | 003°17.580'E | 0.0 | 0.0 | 10.6 | 113.4 | 105.2 | -3.0 |
| 03 Mar 2006 | 07:39:10 | Auto | 52°07.686'N | 003°17.379'E | 0.0 | 0.0 | 11.0 | 160.2 | 142.5 | -3.0 |
| 03 Mar 2006 | 07:38:10 | Auto | 52°07.861'N | 003°17.348'E | 0.0 | 0.0 | 10.6 | 189.2 | 179.9 | -3.0 |

File name: details.log Time: LOCAL (UTC +2:00) Datum: WGS 84

First 1000 Prev 1000 Last 445

Use **First 1000, Prev 1000, Next 1000** and **Last xxx (**xxx=number, in above example it is 449) buttons to select desired time to be listed in the log viewer.

**Note:** For how to make a user chart from this log and other logs, see section 16.9 Making a User Chart from a Log (past track).

## 16.3 Voyage Log

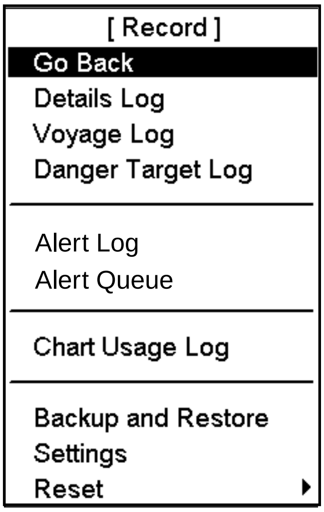
The voyage log holds data for the entire voyage. Recorded events are:

- Changes of course and speed. User can define limits for course change and speed change of own ship to be recorded. This data is filed in the log as type "Ship".
- User is able to define time period, how often there is a recording regardless of course or speed changes. (For example, once per 4 hours). This data is filed in the log as type "Auto".
- Man Over Board event. This data is filed in the log as type "MOB".
- Standard event. This data is filed in the log as type "User".
- Alerts generated by the system. User is able to choose alerts, which are recorded into the Voyage log. This data is filed in the log as type "Alert".
- Positions. This data is filed in the log as type "Posdev".

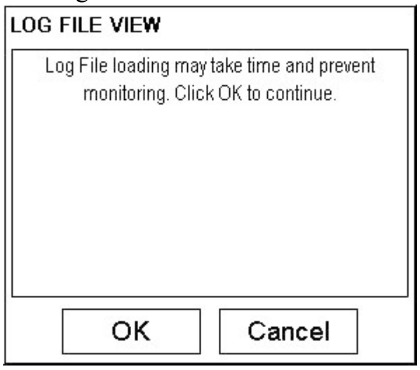
Each log entry also contains wind speed and direction, depth information and distance counter value.

### 16.3.1 How to view the voyage log

To open the voyage log, do the following:

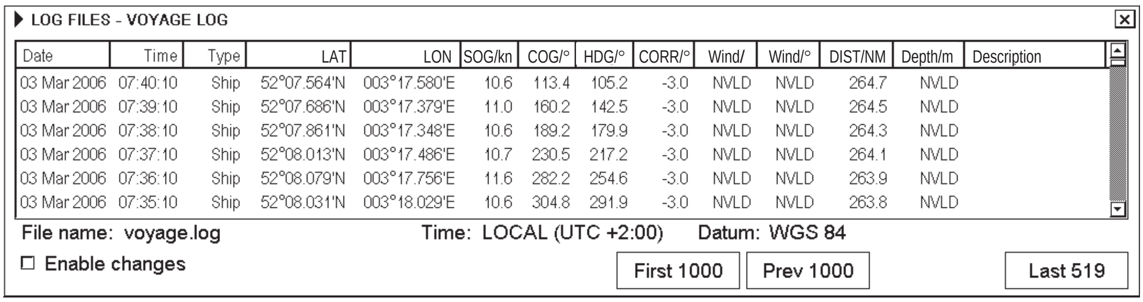



1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Record from the menu then push the scrollwheel. Choose Voyage Log from the menu then push the scrollwheel.
3. The following window appears. Confirm that you want to open the log by clicking the **OK** button. Otherwise click the **Cancel** button.




The system will start viewing program of log.

You can print the entire log or a desired part. To change print font size, put the cursor on the triangle and choose desired font size. To print the log, click the **Print Log** button. To print whole log, select **Print All** from the menu.



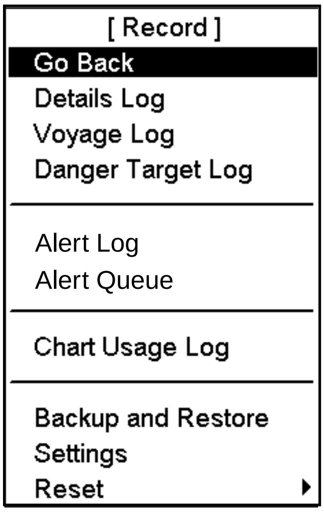

| Date | Time | Type | LAT | LON | SOG/kn | COG/° | HDG/° | CORR/° | Wind/ | Wind/° | DIST/NM | Depth/m | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 03 Mar 2006 | 07:40:10 | Ship | 52°07.564'N | 003°17.580'E | 10.6 | 113.4 | 105.2 | -3.0 | NVLD | NVLD | 264.7 | NVLD | |
| 03 Mar 2006 | 07:39:10 | Ship | 52°07.686'N | 003°17.379'E | 11.0 | 160.2 | 142.5 | -3.0 | NVLD | NVLD | 264.5 | NVLD | |
| 03 Mar 2006 | 07:38:10 | Ship | 52°07.861'N | 003°17.348'E | 10.6 | 189.2 | 179.9 | -3.0 | NVLD | NVLD | 264.3 | NVLD | |
| 03 Mar 2006 | 07:37:10 | Ship | 52°08.013'N | 003°17.486'E | 10.7 | 230.5 | 217.2 | -3.0 | NVLD | NVLD | 264.1 | NVLD | |
| 03 Mar 2006 | 07:36:10 | Ship | 52°08.079'N | 003°17.756'E | 11.6 | 282.2 | 254.6 | -3.0 | NVLD | NVLD | 263.9 | NVLD | |
| 03 Mar 2006 | 07:35:10 | Ship | 52°08.031'N | 003°18.029'E | 10.6 | 304.8 | 291.9 | -3.0 | NVLD | NVLD | 263.8 | NVLD | |

Use **First 1000, Prev 1000, Next 1000** and **Last xxx** buttons to select desired time to be listed in the log viewer.

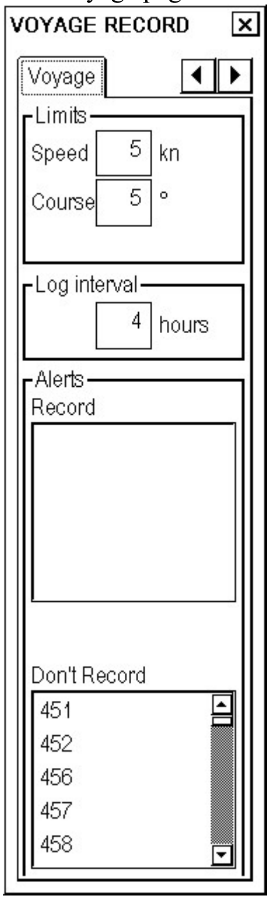
**Note:** You can add a description to a log entry. Check Enable changes then enter description desired in the text box, using the scrollwheel.

## 16.3.2 How to set conditions of logging

The operator can define limits for course change and speed change of own ship to be recorded and also time period for automatic logging. To set them, do the following:




1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Record from the menu then push the scrollwheel.
3. Choose Settings from the menu then push the scrollwheel.
4. If the Voyage page is not already open, click the Voyage tab to open it.




5. Set desired limits for speed and course and also logging interval, using the scrollwheel. When the speed or course changes by the amount set here, a log entry is made.
6. Choose alerts (alert numbers) to record, in the Alerts window. For alert numbers and their meanings, see Chapter 9 Chart Alerts.

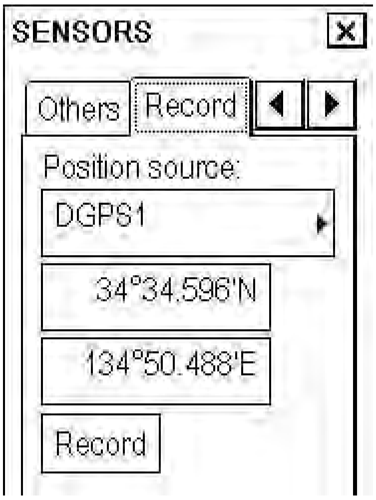
## 16.3.3 How to reset voyage log for next voyage

For how to empty the voyage log, see section 16.8 How to Reset (emptying) Voyage and Danger Target Logs. A backup copy of the voyage log can be made. See section 16.7 How to Make Backup Copy from Log for details.

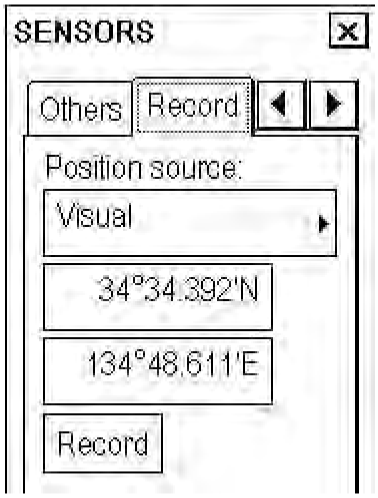
### 16.3.4 Recording positions

The operator may manually save positions to the voyage log in various ways. These are:

- Direct sensor position
- Positions calculated by the system (in example below such are Kalman filter and Dead reckoning)
- User observations. (Visual, astronomical and MFDF. MFDF is Medium Frequency Direction Finder.)




*An example of saving direct position or position calculated by the system*




*An example of saving position based on user observation*

First you should locate the position of your observation on the display. Use, for example, the two separate EBL and VRM available in the Nav Marks dialog box. Open the Sensors dialog box then click the Record tab. Choose appropriate method from the Position source list box. Put the cursor on the desired location on the chart radar display then press the left button. The latitude/longitude position of the cursor is then copied to the Lat and Lon fields. If you are satisfied, then click the **Record** button to save the position observation into the voyage log. If you wish you can also enter Lat and Lon values manually.

### *Position fixes defined by Line of Position (LOP)*

A plotted line on which a vessel is located, determined by observation or measurement of the range or bearing to an aid to navigation or other charted element. Two or more simultaneous observations can be combined to produce an estimate of the ship's current position. If the position is based on only two observations, it is an "estimated position" (EP); otherwise it is called a fix. Line of Position (LOP) can be found in the Sensors dialog, Record tab as one of the Position Sources. A maximum of 6 observations can be entered to obtain a fix.

**Basic operation:** Coordinates of the aid to navigation can be entered into dialog boxes or they can be selected graphically on the chart:

- S57, click on a charted object (beacon, light, buoy etc.). Description of the object appears above coordinate boxes.
- ARCS: click anywhere in the chart.

Default values for bearing and range are approximated from ship's current position information. The time of observation is stopped when the object is selected (or when Add button is clicked). Click Add button to include the observation in the fix computation. The counter shows "new/1", and a second observation may be entered. The word "new" indicates that the observation currently displayed is not yet included in the fix computation, and it appears as a dashed line or ring on the chart. The added observations can be edited or deleted after selecting them in the counter. When at least two measurements are entered, the EP or fix is computed and the coordinates are shown in the top part of the dialog, and a position symbol appears on the chart. In the case of an EP, the letters EP are shown on the right side of the coordinates. If a valid position estimate cannot be obtained, a message is displayed under the coordinates. This may happen, for example, if the lines / circles have multiple crossings that are far apart, or if two lines are nearly parallel or don't intersect at all. The accuracy limit (estimated standard error) is 1.0 NM. If the estimate is valid, the Record button can be clicked to record the current position estimate in the voyage log. Discrepancy between LOP result and ship position is also recorded in the log (this information may be viewed by Info query on the position event symbol on the chart – which is displayed if position event display is on in chart display settings). If dead reckoning is active, the button Use for DR is visible and clicking it will make the LOP position a new starting point for DR.

**Time transfer:** If the observations are not simultaneous, they should be transferred to a common time. Transferring is based on dead reckoning of ship movement. If a position line (or ring) is transferred, the letters TPL are shown beside its timestamp on the chart. The method of transfer may be selected in the bottom of the dialog. Transfer to latest transfers the measurements as if they were all made at the time of the newest measurement. Continuous transfer transfers all measurements to real time. Transfer off can be used to check where the measurement origins are. The position estimate and the record function follow the same logic, which means that Transfer off shows a position that has no relevance and Transfer to latest sends an old position to the voyage log (timestamp in the log does not match the position).

**Timeouts:** The observations cannot be used long after they were made because dead reckoning is inaccurate.

- One minute after the latest measurement it is labeled as a "DR" (dead reckoned position).
- The computed position times out in 5 minutes after the latest measurement
- An observation times out in 10 minutes, after which it disappears without any notice to the user

# 16.4 Danger Target Log

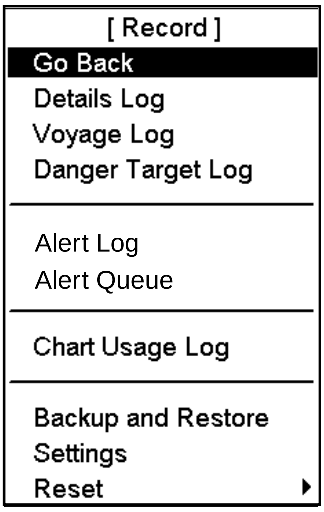
The danger target log stores information about targets that are received from a radar (TTs) and/or targets that are received from an AIS transponder (AIS targets).

If a TT or AIS target is within the set CPA and TCPA, information of all TTs (including non-dangerous targets) are recorded into the danger target log. This data is as follows:

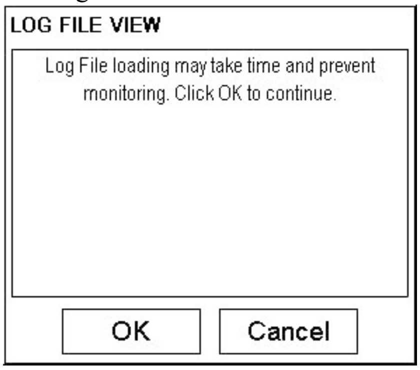
- Date and time, index of target (number of TT on Radar or IMO MMSI number from AIS transponder).
- CPA and TCPA of both AIS and TTs
- Position (Lat, Lon), speed (Spd) and course (Crs) of both AIS and TTs.
- Heading (Hdg) information of AIS target.

## 16.4.1 How to view the danger target log

To open the Danger Target log, do the following:

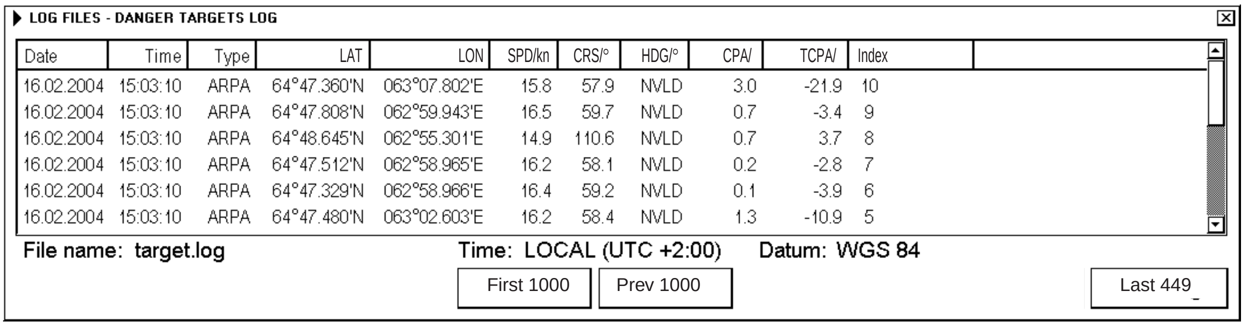



1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Record from the menu then push the scrollwheel.
3. Choose Danger Target Log from the menu then push the scrollwheel.
4. The following window appears. Confirm that you want to open the log by clicking the **OK** button. Otherwise click the **Cancel** button.




The system will start viewing program of log.

You can print the entire log or a desired part. To change print font size, put the cursor on the triangle and choose desired font size. To print the log, click the **Print Log** button. To print whole log, select **Print All** from the menu.



LOG FILES - DANGER TARGETS LOG

| Date | Time | Type | LAT | LON | SPD/kn | CRS/° | HDG/° | CPA/ | TCPA/ | Index |
|---|---|---|---|---|---|---|---|---|---|---|
| 16.02.2004 | 15:03:10 | ARPA | 64°47.360'N | 063°07.802'E | 15.8 | 57.9 | NVLD | 3.0 | -21.9 | 10 |
| 16.02.2004 | 15:03:10 | ARPA | 64°47.808'N | 062°59.943'E | 16.5 | 59.7 | NVLD | 0.7 | -3.4 | 9 |
| 16.02.2004 | 15:03:10 | ARPA | 64°48.645'N | 062°55.301'E | 14.9 | 110.6 | NVLD | 0.7 | 3.7 | 8 |
| 16.02.2004 | 15:03:10 | ARPA | 64°47.512'N | 062°58.965'E | 16.2 | 58.1 | NVLD | 0.2 | -2.8 | 7 |
| 16.02.2004 | 15:03:10 | ARPA | 64°47.329'N | 062°58.966'E | 16.4 | 59.2 | NVLD | 0.1 | -3.9 | 6 |
| 16.02.2004 | 15:03:10 | ARPA | 64°47.480'N | 063°02.603'E | 16.2 | 58.4 | NVLD | 1.3 | -10.9 | 5 |

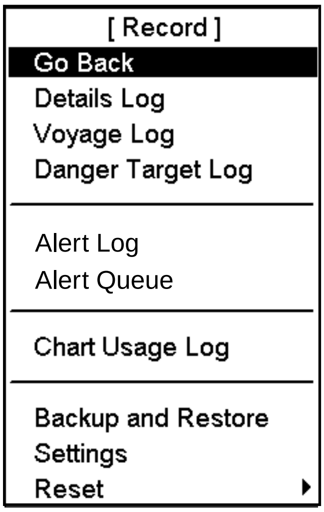
File name: target.log Time: LOCAL (UTC +2:00) Datum: WGS 84

First 1000 | Prev 1000 | Last 449

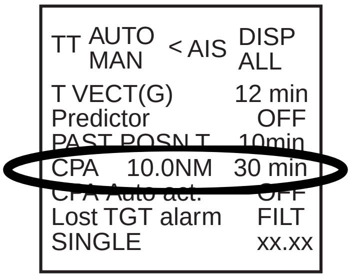
Use **First 1000, Prev 1000, Next 1000** and **Last xxx** buttons to select desired time to be listed in the log viewer.

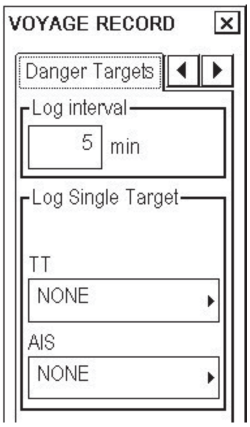
### 16.4.2 How to set conditions for viewing and logging of danger targets

The operator may set Closest Point of Arrival (CPA), Time for CPA (TCPA) and Log interval for viewing dangerous TT and AIS targets on the chart radar display. User can also alternatively log only information of a single chosen TT or AIS target.




1. Spin the scrollwheel to show Menu/Info/Chart Menu in the mouse functions area then push the left mouse button.
2. Choose Record from the menu and Settings from the submenu.
3. If the Danger Targets page is not already open, click the Danger Targets tab to open it.




### 16.4.3 How to save past track of a chosen TT or AIS target

To save past track of chosen TT or AIS target, do the following:

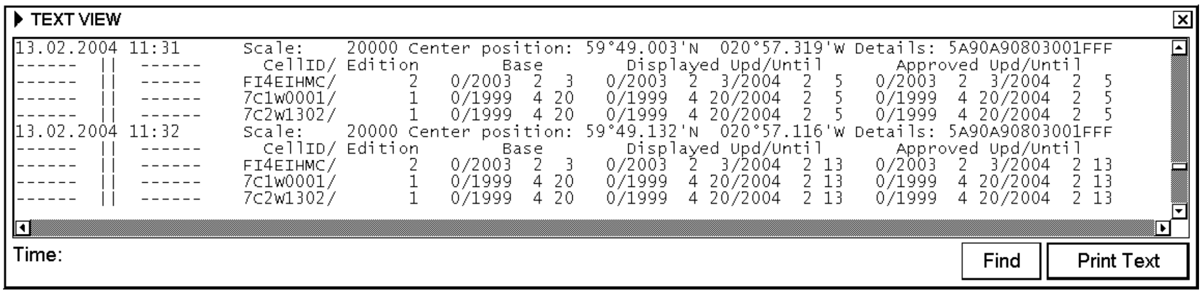
1. Find number of TT or name of AIS target, by placing the cursor on the target then pushing the scrollwheel.
2. Choose Settings from the Record menu then open the Danger Targets page.
3. In the Log Single Target window, choose TT number and/or AIS target name from the TT and AIS boxes.
4. You can make a user chart from the danger target log. For further details see section 16.9 Making a User Chart from a Log (past track).

**Note:** By choosing a single target only the chosen target's information is recorded. If you want to record information of all danger targets, remove selection from the boxes in the Log Single Target window.

# 16.5 Chart Usage Log

The chart usage log stores which charts were displayed on the chart radar chart display area or which were used for chart alerts. The following information is recorded in the chart usage log:

- Chart ID
- Chart edition
- The latest update included to chart
- Displayed Updates Until
- Approved Updates Until
- Center position of display (Lat, Lon).
- Scale of chart display
- Details of chart chosen for display

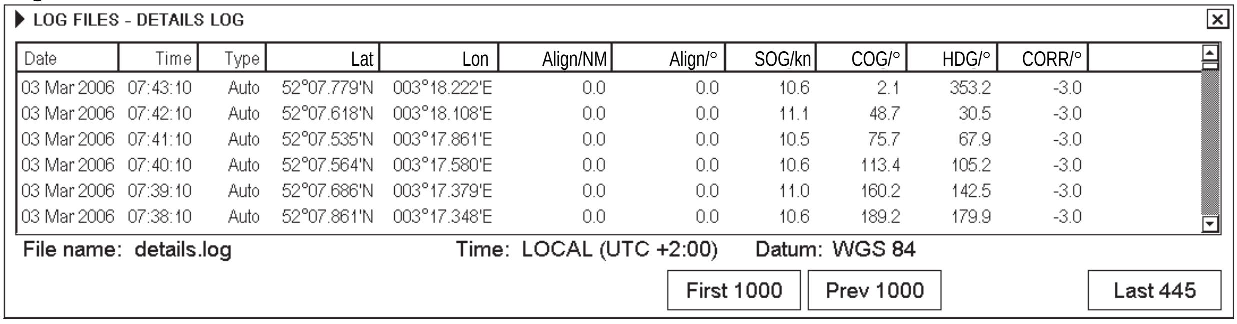



# 16.6 How to Print Logs

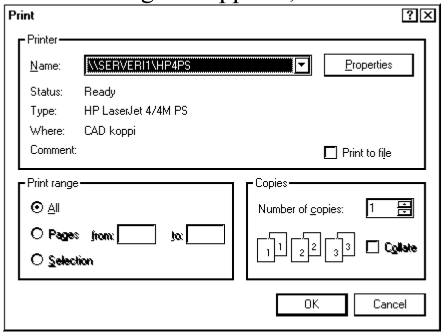
This procedure is the same if you make User Chart from Details, Voyage or Danger Target log.

## 16.6.1 How to print entire log

1. Open the Main menu, choose Record then choose appropriate Log item. The example below shows the Details Log.



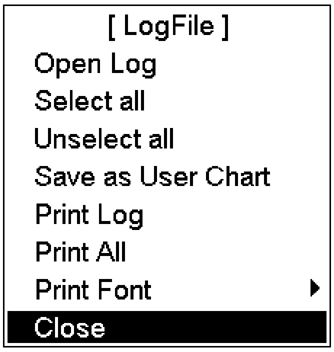

2. Put the cursor on the triangle to show Log File menu and select Print Log.
3. To print a log, click the **Print Log** button. To print whole log, select **Print All** from the menu.
4. A Print dialog box appears, click the **OK** button. The entire log will be printed.



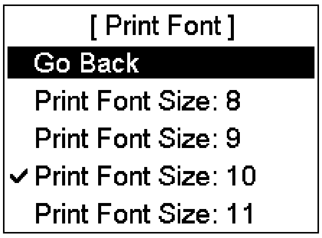
### 16.6.2 How to change font size for paper copy of logs

In each log (Details, Voyage or Danger Targets log) you can choose font size for printed version. To change font size, do the following:

1. Open desired log.
2. Put the cursor on the triangle on the upper left corner and select Print Font.



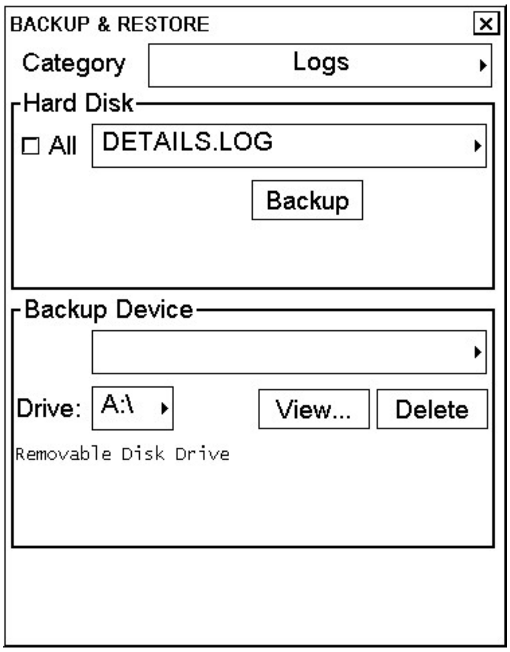

3. Select desired font size.




## 16.7 How to Make Backup Copy from Logs

If necessary you can make a backup copy of chart radar logs onto a floppy disk as follows:

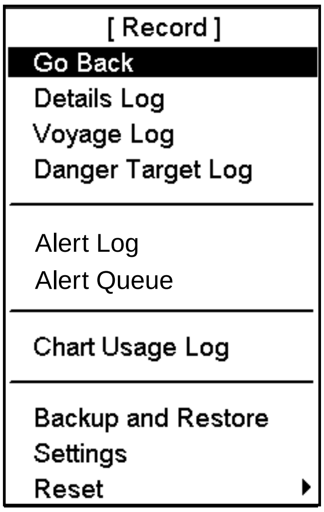
1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Record from the menu then push the scrollwheel.
3. Choose Backup and Restore from the menu then push the scrollwheel to show the Backup and Restore dialog box.

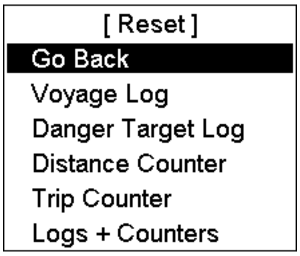



4. Choose desired log and drive for backup copy. Then, click the **Backup** button.

## 16.8 How to Reset (emptying) Voyage and Danger Target Logs

It may be useful to reset (empty) the voyage and danger target logs when you are starting a new voyage. If necessary, make a backup copy before resetting. To reset a log, do the following:



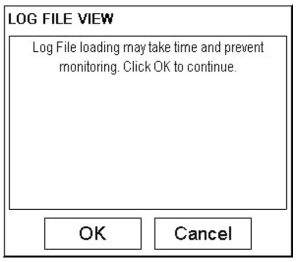




1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Record from the menu then push the scrollwheel.
3. Choose Reset from the menu then push the scrollwheel.
4. Choose the log to reset from the menu then push the scrollwheel.
5. The system will ask you if you are sure to reset chosen log. Click the **OK** button to reset the chosen log.

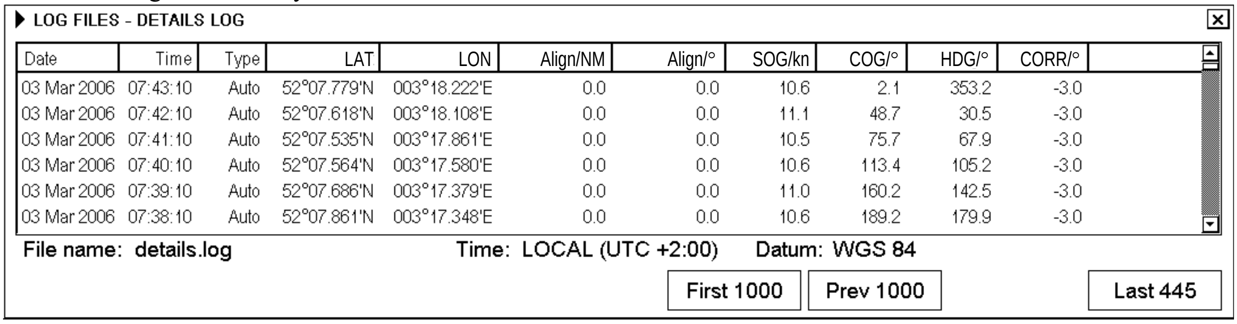
## 16.9 Making a User Chart from a Log (past track)

You can create a user chart from any log among details, voyage and danger target. The past track of the Danger Log target is useful for making a use chart from a single target.

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the mouse functions area then push the left mouse button. Choose Record from the menu then push the scrollwheel.
2. Choose the log (Details, Voyage, Danger Target) from which you want to make a user chart then push the scrollwheel.




3. Click the **OK** button to continue.
4. Choose the log entries that you want to use to create a user chart.



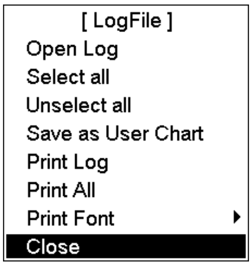
LOG FILES - DETAILS LOG

| Date | Time | Type | LAT | LON | Align/NM | Align/° | SOG/kn | COG/° | HDG/° | CORR/° |
|---|---|---|---|---|---|---|---|---|---|---|
| 03 Mar 2006 | 07:43:10 | Auto | 52°07.779'N | 003°18.222'E | 0.0 | 0.0 | 10.6 | 2.1 | 353.2 | -3.0 |
| 03 Mar 2006 | 07:42:10 | Auto | 52°07.618'N | 003°18.108'E | 0.0 | 0.0 | 11.1 | 48.7 | 30.5 | -3.0 |
| 03 Mar 2006 | 07:41:10 | Auto | 52°07.535'N | 003°17.861'E | 0.0 | 0.0 | 10.5 | 75.7 | 67.9 | -3.0 |
| 03 Mar 2006 | 07:40:10 | Auto | 52°07.564'N | 003°17.580'E | 0.0 | 0.0 | 10.6 | 113.4 | 105.2 | -3.0 |
| 03 Mar 2006 | 07:39:10 | Auto | 52°07.686'N | 003°17.379'E | 0.0 | 0.0 | 11.0 | 160.2 | 142.5 | -3.0 |
| 03 Mar 2006 | 07:38:10 | Auto | 52°07.861'N | 003°17.348'E | 0.0 | 0.0 | 10.6 | 189.2 | 179.9 | -3.0 |

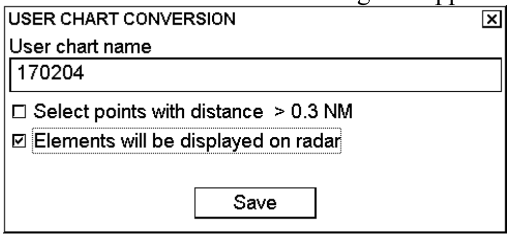
File name: details.log    Time: LOCAL (UTC +2:00)    Datum: WGS 84

First 1000    Prev 1000    Last 445

5. Click the triangle and select "Save as User Chart" to show log.




6. The User Chart Conversion dialog box appears.



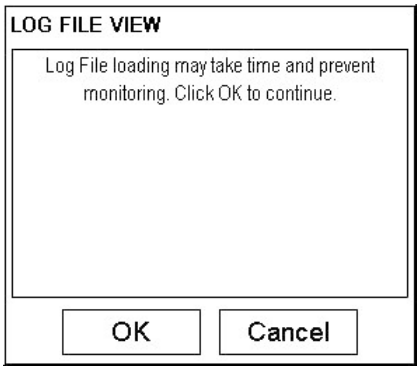

This dialog box contains the following fields:

**User chart name:** Enter name for the user chart.

**Select points with distance > 0.3 NM:** Check to have the system filter the chosen log so that the minimum distance between points in the user chart is 0.3 nm.

**Elements will be displayed on radar:** Check to display the chart on the radar screen.

7. Click the **Save** button.

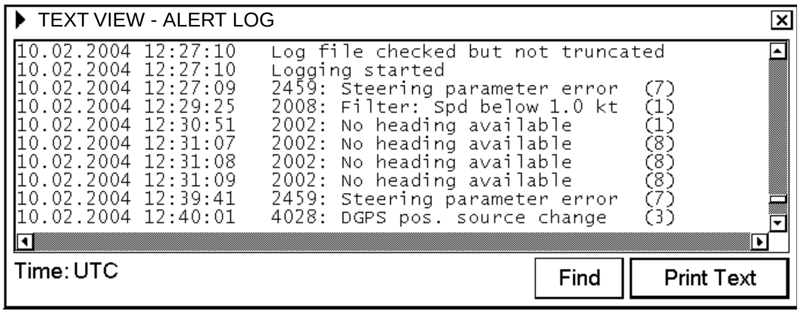



8. Confirm creating of user chart by clicking the **OK** button.

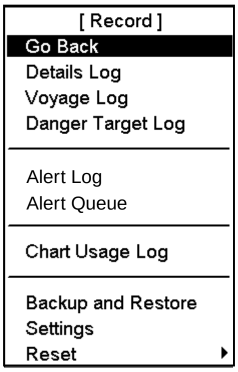
**Note:** If your chosen range for conversion from log to user chart contains periods of invalid your ship's positions, then the user chart has a gap in the line for these periods.

# 16.10 Alert Log

The Alert Log collects and records alerts generated by the system. You can view a list of generated alerts using the Alert Log.




To open the log, proceed as follows:

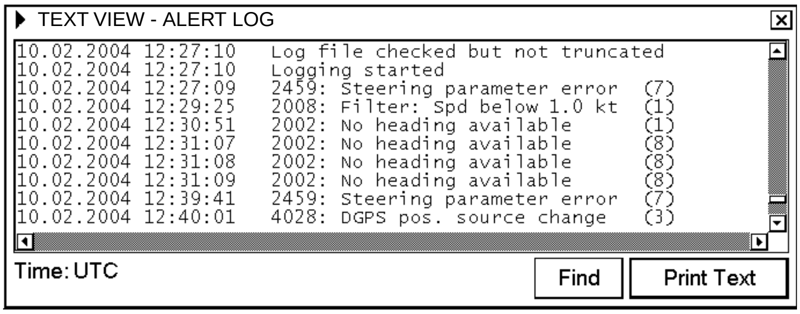



1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button. Choose Record from the menu then push the scrollwheel.
2. Choose Alert Log from the menu then push the scrollwheel.

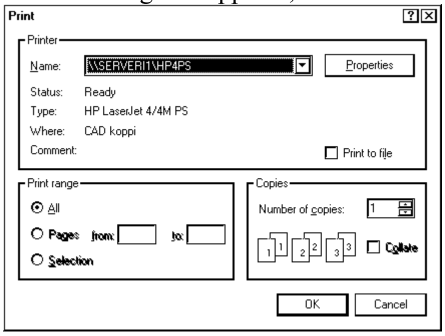
The Alert Log appears on the display. See below for an example.

## 16.10.1 How to print the latest alert

1. Open the Record menu following step 1 in the above procedure.
2. Choose Alert Log from the menu then push the scrollwheel.

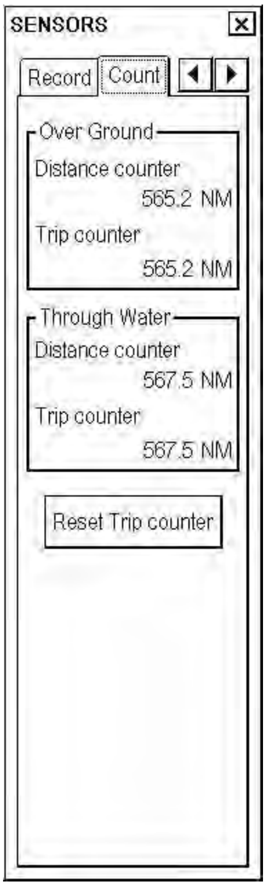



3. Click the **Print Text** button.
4. A Print dialog box appears; click the **OK** button to print (complete log).



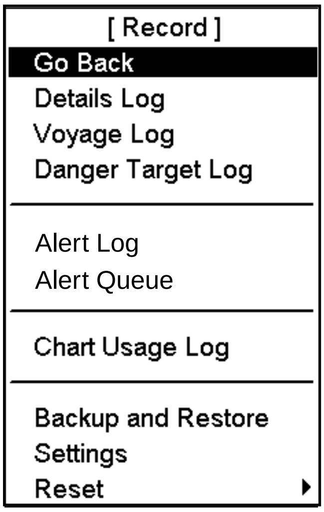
# 16.11 Distance and Trip Counters

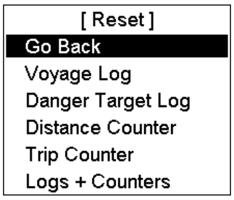
Distance and trip counters have separate fields for both through water and over ground distances. This information is available on the Record page of the Sensors dialog box, shown right. To reset the distance and/or trip counter, see the section that follows.




## 16.11.1 How to reset distance and trip counters

It is useful to reset the distance counter when you are starting a new voyage.




**To reset the distance and trip counters**:

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button. Choose Record from the menu then push the scrollwheel.
2. Choose Reset from the menu then push the scrollwheel.
3. Choose Distance Counter from the submenu then push the scrollwheel.
4. You are asked if you are sure to reset the distance and trip counters; click the **OK** button to reset those counters.

**To reset only the trip counter**:

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button. Choose Record from the menu then push the scrollwheel.
2. Choose Reset from the menu then push the scrollwheel.
3. Choose Trip Counter from the submenu then push the scrollwheel.
4. You are asked if you are sure to reset the trip counter; click the **OK** button to reset the trip counter.

# 17. NAVTEX Messages

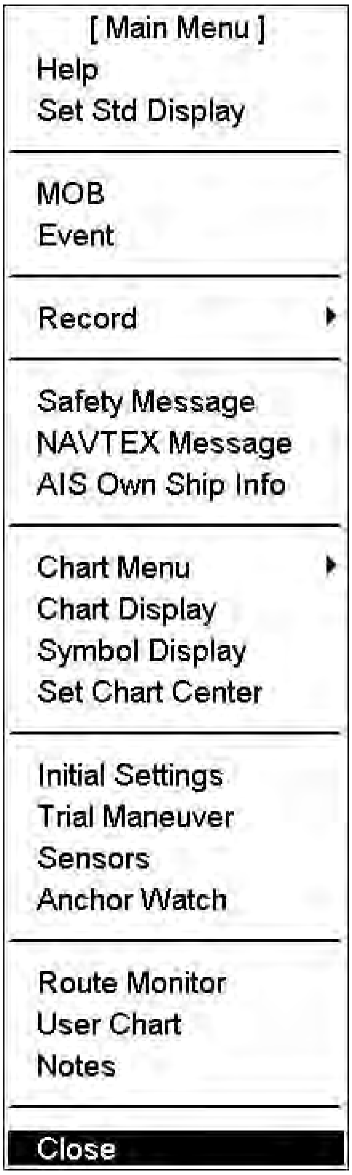
## 17.1 Introduction

NAVTEX (Navigational Telex) is an international automated medium frequency direct-printing service for delivery of navigational and meteorological warnings and forecasts, as well as urgent marine safety information to ships.

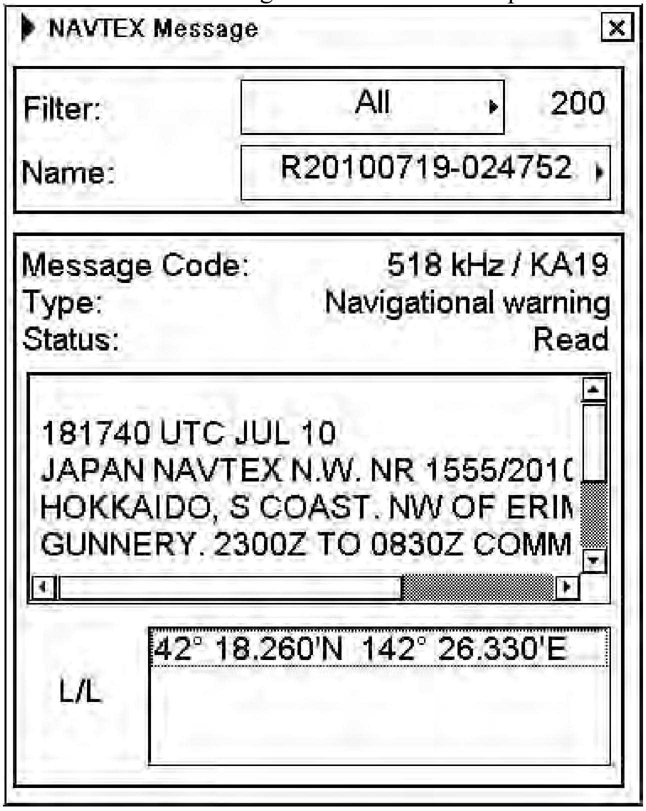
NAVTEX messages can be read and written in the ECDIS mode.

## 17.2 How to Receive NAVTEX messages

When NAVTEX message is received in ECDIS an alert "798 NAVTEX message received" appears. To display NAVTEX message:




1. Display Menu/Info/Chart Menu in the mouse functions area then push the left mouse button to open the Main menu.
2. Select NAVTEX Message from the menu then push the scrollwheel.




3. In the Filter field, select Unread.

**Note:** Lat/Lon field is a list of lat/lon coordinates found from Navtex message using artificial intelligence. Typically such coordinates show the point or area of interest for the Navtex message.

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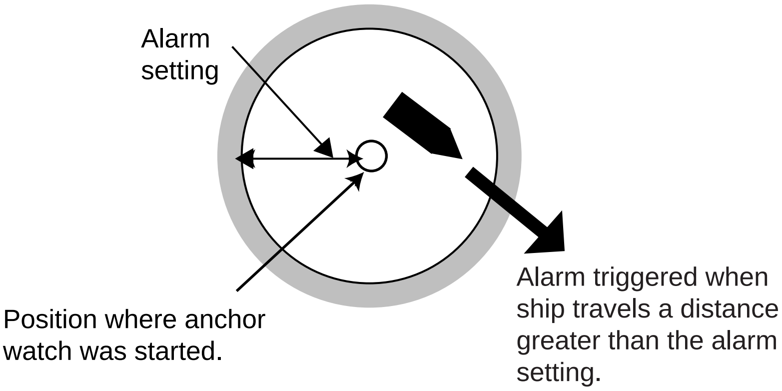
# 18. Anchor Watch

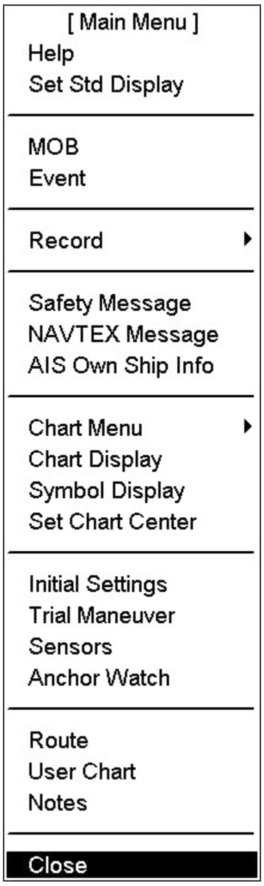
## 18.1 Introduction

Anchor watch checks to see if your ship is drifting when it should be at rest. Set the limit for anchor watch on the menu. If your vessel drifts more than the distance set, the alert "**874: Anchor watch**" appears.

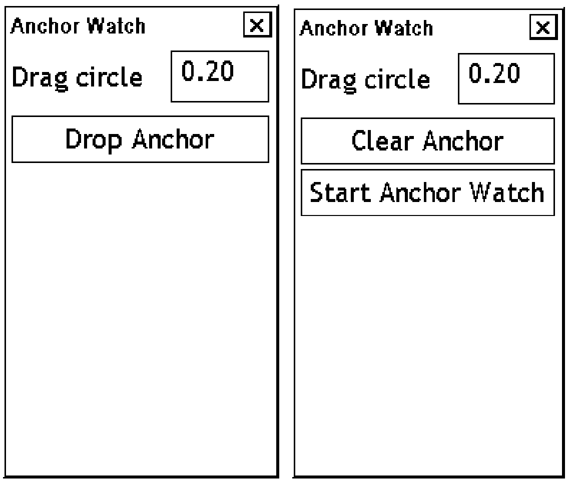



## 18.2 How to Activate Anchor Watch

To activate the anchor watch, do the procedure shown below.



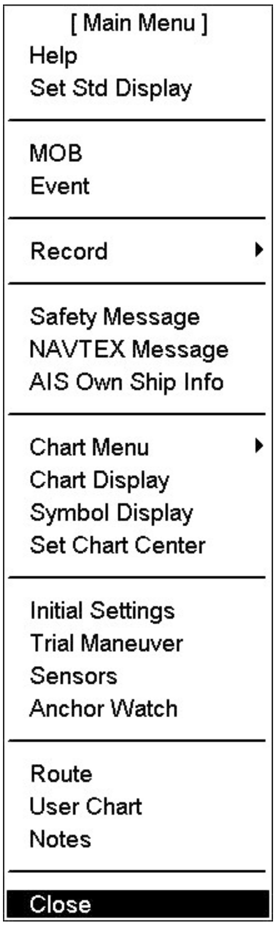

1. Open the main menu.
2. Select Anchor Watch.
3. Enter desired value in the Drag circle field.
4. Drop the anchor then click the **Drop Anchor** button. The **Start Anchor Watch** button appears (below the **Clear Anchor** button).
5. To start the anchor watch, click the **Start Anchor Watch** button.



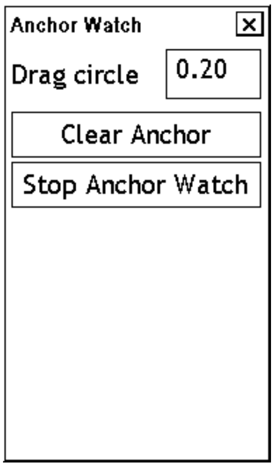

If your vessel travels more than the distance set here, the alert "**874: Anchor watch**" appears. To continue to use the anchor watch, click the **Clear Anchor** button to start the alarm from your current position.

## 18.3 How to Deactivate Anchor Watch

To deactivate the anchor watch, do the procedure shown below:




1. Open the main menu.
2. Select Anchor Watch.
3. Click the **Stop Anchor Watch** button.



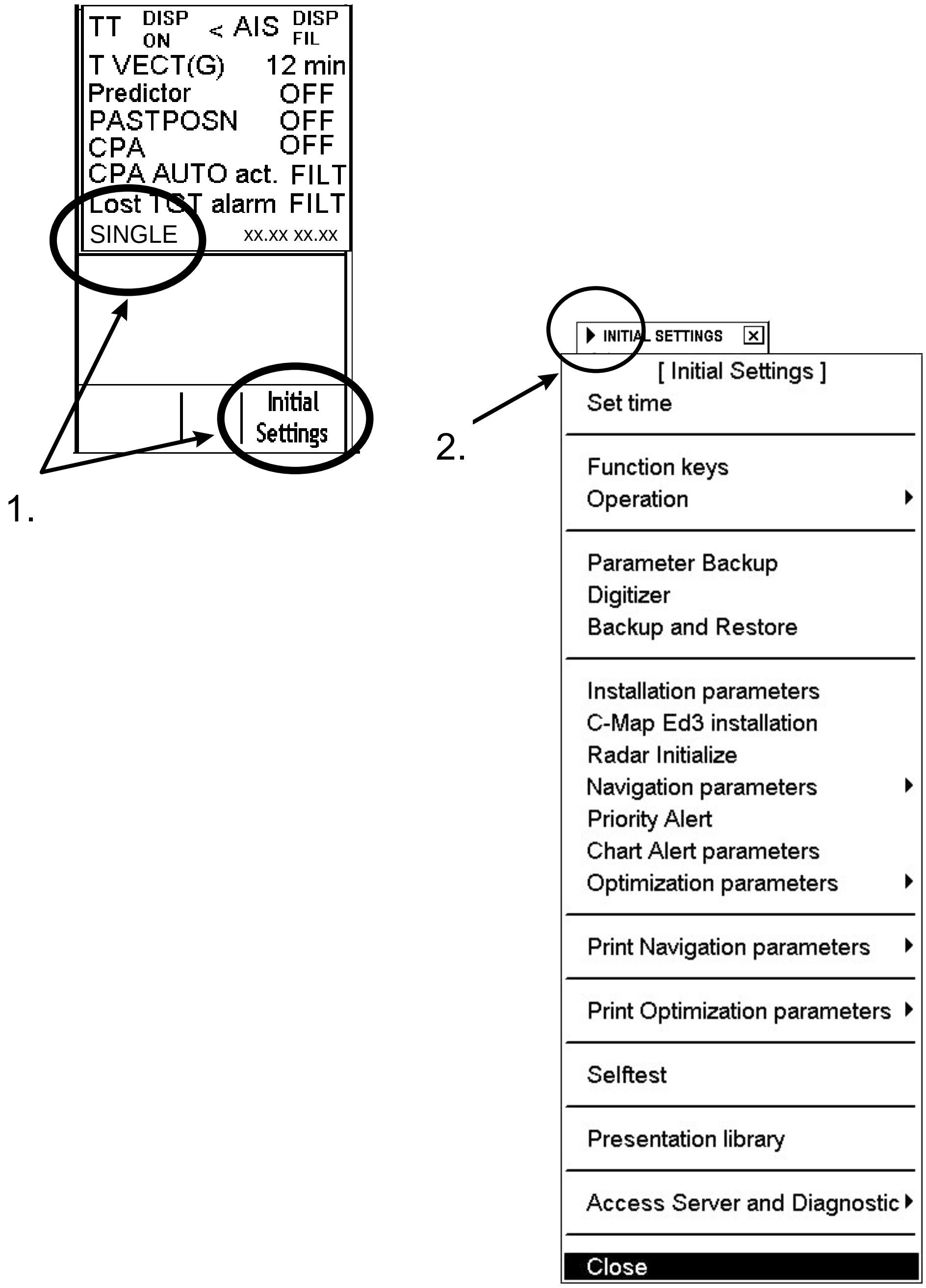
# 19. Parameters Setup

## 19.1 Parameters

The Initial Settings menu in the Initial Settings dialog box contains the installation parameters, navigation parameters and optimization parameters that define the configuration of the chart radar and operative parameters that are either used to control steering and navigation calculation or used during route planning.

To open the Initial Settings menu, do the following:

1. Put the cursor on the text SINGLE on the lower right corner of the information area, confirm that Initial Settings appears in the guidance area, then push the right button to open the Initial Settings dialog box.



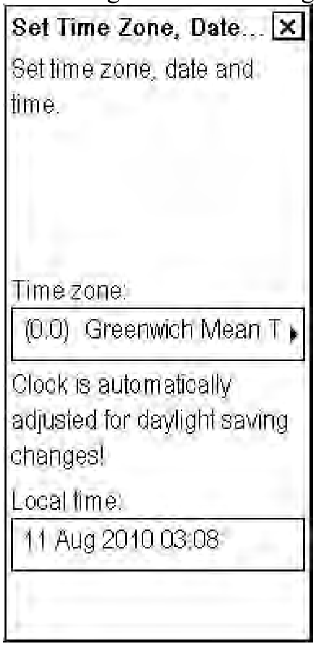

2. Put the cursor on the triangle in the Initial Settings dialog box to show the Initial Settings menu.

### 19.1.1 Parameter-related menus

#### *How to set time*

Put the cursor on the date and time presentation on right-hand side of chart radar display.

- Use the left button to display UTC time and local time alternately.
- Use the right button to change time zone and/or time.




***In order to set the time, the Kalman filter must be OFF.***

#### *Parameter backup*

User can make backup copy of parameters. See Chapter 14 Backup Operations for details.

#### *Installation parameters*

The chart radar system parameters are set by the installation parameters.

#### *Radar initialize*

For radar initialization.

**Note:** Access to the installation and radar parameters requires a key disk, which is delivered by the manufacturer. For details see the installation manual.

#### *Navigation parameters*

Parameters for your ship and routes. For more information about setting navigation parameters, see section 19.1.3 Navigation parameters setting.

#### *Optimization parameters*

This function is used to define parameters for speed and fuel consumption. For further details, see section 19.1.4 Optimization parameters setting.

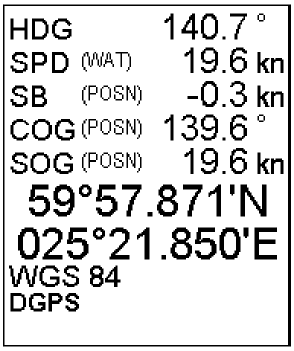
#### *Print navigation parameters*

Prints navigation parameters to default printer.

#### *Print optimization parameters*

Prints optimization parameters to default printer.

## 19.1.2 How to select datum




Datum is used to choose between different models of the earth. It is essential that you use Datum in a consistent way.

If you use paper charts together with electronic chart material, it is recommended that you use the same datum as your current paper chart to avoid misalignment between your electronic system and points taken or plotted on your current paper chart.

Once you have chosen a datum, all numerical latitude-longitude position values are presented in your chosen datum.

To choose datum do the following:

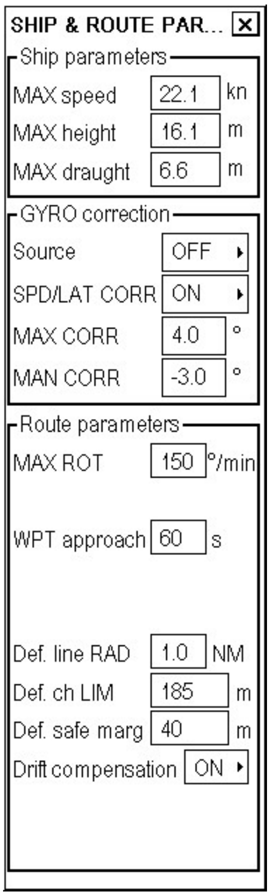
1. Put the cursor on the datum indication at the upper right corner of the display.
2. Spin the scrollwheel to choose appropriate datum then push the scrollwheel.

## 19.1.3 Navigation parameters setting

The purpose of navigation parameters is set the basic parameters for the ship. These parameters are relative to ship steering and they are very important to get correct function of the integrated navigation system. They must be maintained carefully. Modification requires a good knowledge of the parameters' importance.

In order to edit Ship and Route parameters, do the following:

1. Open the menu and choose the Initial Settings dialog box.
2. Put the cursor on the triangle mark, choose Navigation parameters then push the scrollwheel.
3. Choose Ship and Route parameters from the menu then push the scrollwheel.




### *Ship parameters*

**MAX speed:** Maximum speed the ship can do.

**MAX height:** Max. height of ship above sea level.

**MAX draught:** Max. draught of ship.

### *GYRO correction*

**Source**: Choose method of gyro error correction, auto, manual or off.

**SPD/LAT CORR.**: Select On or Off.

**MAX CORR.**: Enter max. value for correction

**MAN CORR.**: Enter value for manual gyro correction.

### *Route parameters*

**MAX ROT.:** Set the maximum rate of turn of the ship.

**WPT approach:** Set the alert time before approaching the wheel over point.

**Drift compensation:** Turn drift compensation on or off.

## 19.1.4 Optimization parameters setting

The optimization parameters are used in optimization calculation. Therefore these parameters must be defined before calculation.

In order to modify optimization parameters, do the following:

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Choose Initial Settings then push the scrollwheel.
3. Put the cursor on the triangle in the Initial Settings dialog box to show the Initial Settings menu.
4. Choose Optimization parameters from the menu then push the scrollwheel.
5. Choose Planning parameters from the menu then push the scrollwheel.
6. Modify optimization parameters by placing the cursor in the desired edit box and using the scrollwheel to set value. Push the scrollwheel to confirm.

**Note 1: HFO:** Heavy fuel oil**, DO:** Diesel oil

**Note 2:** It is not necessary to enter leading zero ("0").

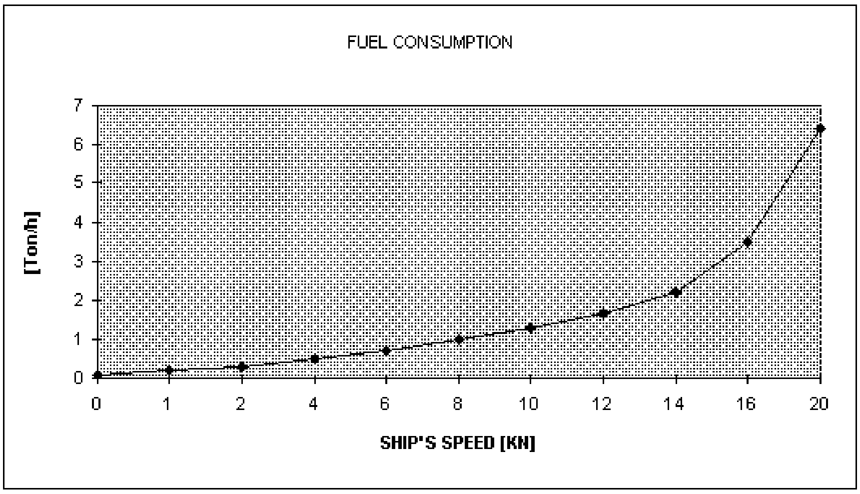
PLANNING OPTIMIZATION PARAMETERS

Cost

| Hour $/h | HFO $/ton | DO $/ton |
|---|---|---|
| 1200 | 75 | 90 |

| Speed kn | HFO ton/h | DO ton/h |
|---|---|---|
| 0.0 | 0.000 | 0.000 |
| 2.0 | 0.600 | 0.100 |
| 4.0 | 0.850 | 0.100 |
| 6.0 | 1.100 | 0.100 |
| 8.0 | 1.400 | 0.100 |
| 10.0 | 1.750 | 0.100 |
| 12.0 | 2.000 | 0.100 |
| 14.0 | 2.400 | 0.100 |
| 16.0 | 2.800 | 0.100 |
| 18.0 | 3.300 | 0.100 |
| 20.0 | 4.000 | 0.100 |

This is a very important data table that contains ship's fuel consumption with the different speeds. There are 11 different speeds available to define fuel consumption on those specific speeds. Prior to entering data in the form, prepare the following graphic in order to find those 11 points.




Set 11 points on the graphic as explained above. Transfer those 11 points to the table in the chart radar. Use more points where the curve bends more.

Example: 3.5 KN = 0.72 Ton / Hour HFO

Use the second graphic for diesel oil, if diesel oil consumption is relative to the speed.

## 19.2 Color Calibration Settings

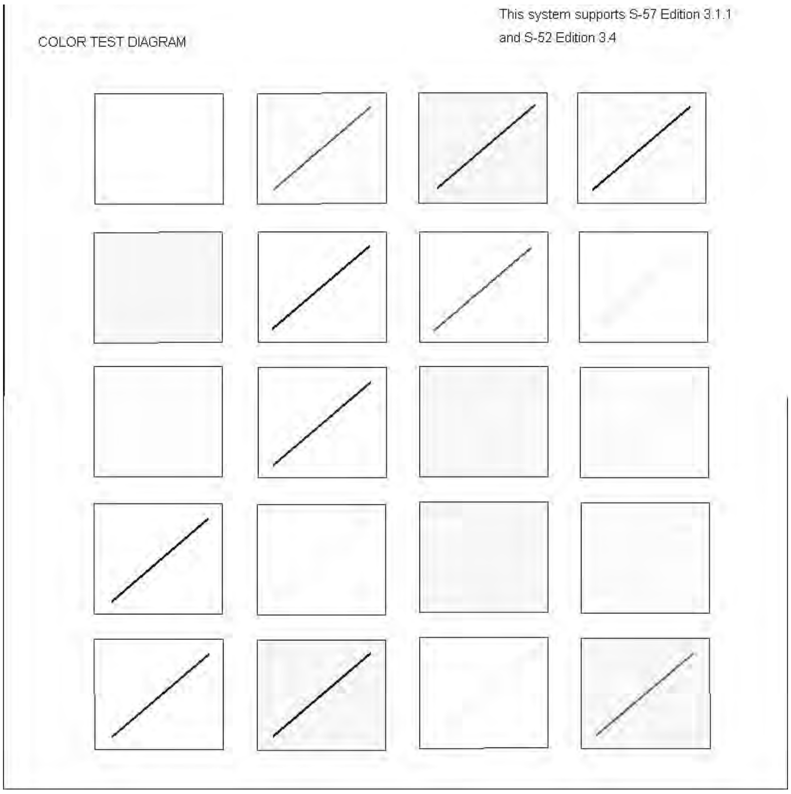
**Note:** Use of the brilliance control (with FURUNO-supplied monitor) may adversely affect the visibility of information on the night display.

### 19.2.1 Color differentiation test for vector charts

You can want to adjust brilliance. You have a tool to check that you can clearly see all details of the charts. For S57 charts this tool is the color differentiation test diagram.

The color differentiation test diagram is a part of ECDIS Chart 1 and you can use it as follows:

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the right button.
2. Select ECDIS Chart 1 from the menu then push the scrollwheel. The display shown right appears.
3. Select Color diagram from the menu then push the scrollwheel.
4. A diagonal line should be present in each of the twenty (1-20) boxes if color differentiation is proper.




*Color diagram*

### 19.2.2 Gray scale test

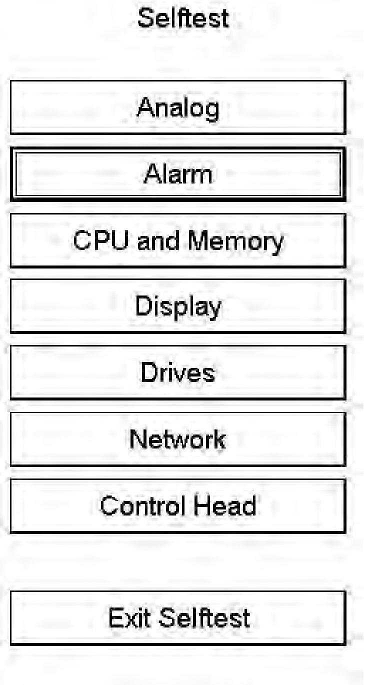
Set brilliance and contrast to calibrated positions. Use the gray scale test to visually inspect neutral shades of gray.

**Note:** During any selftest, the system becomes inoperative and this is indicated by sounding the buzzer and flashing the lamp in the **SYSTEM FAILURE** key on the keyboard-equipped control unit.

To activate the gray scale test, do the following:

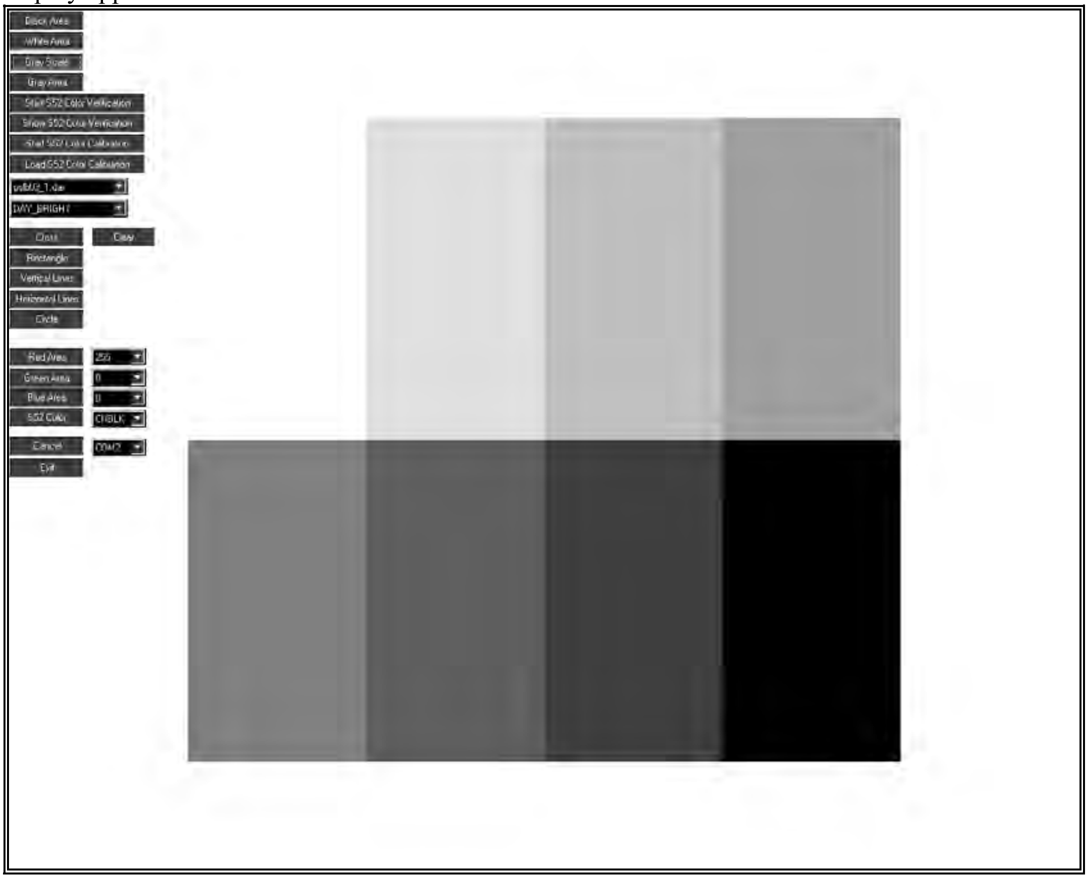
1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area then push the left button.
2. Select Initial Settings from the menu then push the scrollwheel.
3. Put the cursor on the triangle in the menu, select Selftest from the menu then push the scrollwheel.

4. Click the **OK** button. The system will end normal operation and start the Selftest mode.




5. Select **Display** then push the left button.

6. Click the **Gray Scale** button at the upper left-hand corner of display with the left button, and the following display appears:




*Grey scale test pattern*

7. Check for proper display of gray shades.
8. Click the **Exit** button with the left button to close the display.
9. Click the **Exit Test** button to exit the test mode. The system will then start normal operation.

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# 20. Alerts

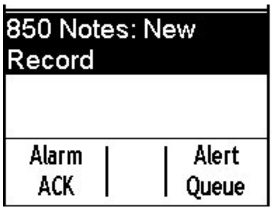
## 20.1 Introduction

FCR-2xx7 is designed to meet requirements set on paper "IMO MSC 252(83)" about use of alert concept instead of alarm concept. Main purpose of this is to reduce continuous alarm bell ringing. In the new concept old alarms are called as alerts and they are subdivided into 3 groups, out of which only alarm provide continuous alarm bell ringing Alerts generated by Chart Radar are divided into three categories:

- **Alarm,** only the most urgent alerts that require your immediate attention. Color of alarm is red and they flash and beep until acknowledged.
- **Warning,** most of alerts are in this category. Color of warning is yellow, in begin of warning there is a short beep and they flash until acknowledged. If a warning is not acknowledged within 60 seconds then the short beep is repeated.
- **Caution,** color of caution is yellow and it is used to indicate doubtful condition.

## 20.2 Overview

Alerts are displayed on the ENC screen at the lower right corner, indicated with "1" in the figure below. "2" in the figure below is the Alert Box, where you acknowledge alerts and display the Alert Queue window that shows alerts generated. To acknowledge an alert or display the Alert Queue window put the cursor in the alert area then push the left mouse button to acknowledge an alert or push the right mouse button to display the Alert Queue window.



There are two kind of alerts generated by the ENC. To see a list of alerts, see section 20.10 List of Alerts.

## 20.3 Alerts Generated by Navigation Calculation

Navigation calculation generates the following alerts

- Error detected in any sensor
- Radar communication error
- Software alerts, etc.

## 20.4 Alerts Generated by Chart Calculation

Chart calculation generates the following alerts

- New Notes page available.
- Chart alerts based on S57 charts.
- Chart alerts based on user chart's dangerous symbols, lines and areas

## 20.5 Alerts Generated by Radar

Alerts generated by Navigation Calculation and Chart Calculation are common for each workstation (i.e. they can be seen on each workstation's alert queue with same alert number). Alerts generated by Radar overlay are generated locally on workstation where failure happens (i.e. they can only be seen on workstation where it happens). Each workstation has own alert numbers for alerts generated by radar overlay.

- Alert range is: Alert 100 - Alert 109, for Chart radar number 1.
- Alert range is: Alert 200 - Alert 209, for Chart radar number 2.
- Alert range is: Alert 150 - Alert 159, for Chart radar number 3
- Alert range is: Alert 250 - Alert 259, for Chart radar number 4
- For example: "100 RadOv No Headline" for Chart radar 1 "200 RadOv No Headline" for Chart radar 2
- Alerts that are generated by radar being source of Radar overlay and/or TTs are as follows:
- Alert range is: Alert 110- alert 120, for radar antenna 1
- Alert range is: Alert 210- alert 220, for radar antenna 2
- Alert range is: Alert 160- alert 170, for radar antenna 3
- Alert range is: Alert 260- alert 270, for radar antenna 4

For example: "110: TT dangerous target" for radar antenna 1 "210: TT dangerous target" for radar antenna 2

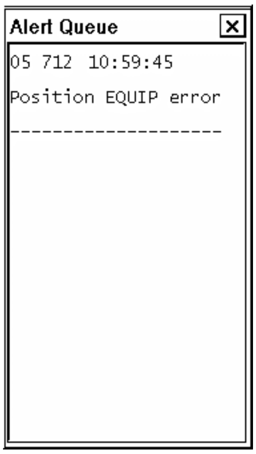
## 20.6 Description of the Alert Priority System

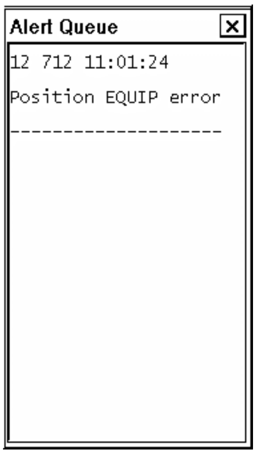
The permanently visible alert is the top most urgent alert at any moment

- Alerts have priority from 1 to 2 to control urgency. Priority 1 is the highest Priority 1 and 2 indicate unacknowledged state. Priority 8 and 9 indicate acknowledged state. The "list of alerts chapters" shows the priorities for each alert with following syntax: "/1" at the end first line means priority = 1, "/1/8" at the end of first line means that priority is = 1, if unacknowledged and priority = 8, if acknowledged but the state of alert still exists.
- Warnings have priority from 3 to 7 with same kind of syntax as alerts. Priorities from 3 to 7 indicate unacknowledged state. Priorities from 10 and 14 indicate acknowledged state. You may view the alerts in the Alert Queue. Put the cursor on the alert text and then push the right mouse button. See the example below.

**How to read the Alert Queue (first row as an example):**

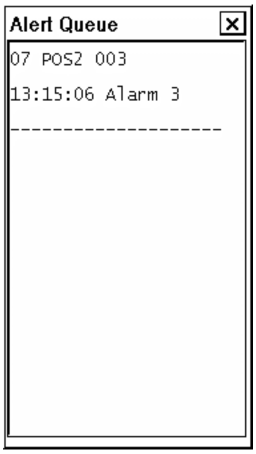
- First digit "05" indicates alarm priority.
- Second three digits "712" indicate alarm number.
- Third six digits indicate time.
- Text indicates reason of alarm "Position source change".
- The example shows how alarm 712 changes its priority from 05 to 12 after it is acknowledged.




**How to read the Alert Queue for an alert from a connected sensor:**

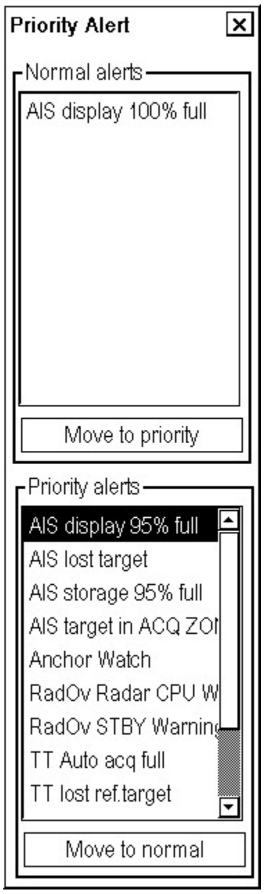
- First digit "07" indicates alarm priority.
- Second four characters "POS2" indicate source. In this example sensor connected to serial line (POS2 = Position equipment 2).
- Third three digits indicate number from ALR.
- Next six digits indicate arrival time of ALR.
- Followed characters are text from ALR



### *How to assign alert priority*

If desired, you can assign alert priority as follows:

1. Spin the scrollwheel to show Menu/Info/Chart menu in the guidance area then push the left button.
2. Roll the scrollwheel to choose Initial Settings then push the scrollwheel.
3. Put the cursor in the Initial Settings dialog box to show the menu displayed at left.
4. Spin the scrollwheel to choose Priority Alert parameters from the menu then push the scrollwheel.




5. Select alert for which you want to give priority. Click the Move to priority button.
6. Click the Close window button (X) to close the menu.

## 20.7 Warnings for Doubtful Integrity

There are a few warnings for which source is doubtful integrity. This kind of warning are "405 Log data unreliable", "407 Position discrepancy" and " 413 SOG/COG data unreliable".

When any of above warning is active, doubtful value itself is presented using color of warning - yellow.

Following values themselves are turned yellow in upper right corner when there is doubtful integrity:

- LAT & LON values of own ship position
- Speed value
- SOG/COG values

Following values in Sensor page turn yellow when there is doubtful integrity:

- Position sensors (position discrepancy) • position sensors (filter exclude)
- Log sensor
- SOG/COG sensors (dual axis log and position sensors)

## 20.8 Alert Reporting to Central Alert Management

An "ALR transmit and ACK receive" communication is available for Central Alert Management (=CAM). In this interface all alerts are reported to CAM. This interface is based on IEC 61162-1 and IEC 80/520/INF.

Based on rules set by IMO MSC 252(83) Central Alert Management can remotely acknowledge some of the alerts and the rest get remote buzzer silence for 30 seconds. The communication with Central Alert management is supervised and if fault is detected then alert "90 CALA OUTPUT CON LOST" is created.

## 20.9 Alert Reception from Connected Sensors

An "ALR receive and ACK transmit" communication is available for every serial line of ECDIS. This is intended for sensors reporting to ECDIS. ALR message from the sensor includes information about alert on sensor. This alert is presented though the normal alert system of this ECDIS. When you acknowledge it then an ACK message is sent to the sensor to perform remote acknowledge.

This interface is based on IEC 61162-1 and IEC 80/520/INF. The communication with the sensor is supervised and if fault is detected then alert "ALARM SENSOR LOST including number 70-85 (depending of serial channel) and source indication label (for example AIS, POS1, etc.) is created.

## 20.10 List of Alerts

It is not possible to acknowledge the radar critical alarms from external equipment without displaying the reason/cause for the alarm. Radar critical alarms are TT COLLISION and AIS COLLISION.

### 20.10.1 List of navigation alerts

```
Alert number 320:   DEPTH BELOW LIMIT       /2/9
             ------------------------------------
             ECHO SOUNDER INDICATES WATER DEPTH
             BELOW TRANSDUCER TO EXCEED SPECIFIED
             SAFE LIMIT.

Alert number 400:   FILTER: POSITION UNRELIABLE  /1
             ------------------------------------
             ECDIS IS NOT ABLE TO ESTIMATE A
             RELIABLE POSITION. VERIFY AND CHOOSE
             SPEED AND POSITION SENSORS THROUGH
             'SENSORS' FUNCTION.

Alert number 401:   NO SPEED AVAILABLE       /1/8
             ------------------------------------
             NO VALID SPEED SENSOR HAS BEEN FOUND.
             VERIFY AND CHOOSE SPEED SEN SORS IN
             'SENSORS' BUTTON

Alert number 402:   NO HEADING AVAILABLE      /1/8
             ------------------------------------
             NO VALID HEADING SENSOR HAS BEEN
             FOUND. VERIFY AND CHOOSE HEADING
             SENSORS IN 'SENSORS' FUNCTION.

Alert number 405:   LOG DATA UNRELIABLE     /7/14
             ------------------------------------
             LOG GIVES 0 KN SPEED, WHICH DOES NOT
             CORRESPOND WITH OTHER SPEED SENSORS.
             VERIFY AND CHOOSE SPEED SENSORS IN
             'SENSORS' FUNCTION.

Alert number 407:   POSITION DISCREPANCY     /7/14
             ------------------------------------
             SYSTEM HAS DETECTED MORE DIFFERENCE
             THAN SET LIMIT BETWEEN OWN SHIP
             PRIMARY AND SECONDARY POSITIONS OR
             BETWEEN OWN SHIP AND ANY SENSOR
             POSITION. CHECK POSITION SENSORS

Alert number 408:   FILTER: SPEED BELOW xx KN    /3/10
             ------------------------------------
             KALMAN FILTER REQUIRED THAT THE
             SPEED OF THE OWN SHIP IS MORE THAN
             SPEED LIMIT SET IN ECDIS
             INSTALLATION PARAMETERS. IF ROUTE
             STEERING WAS NOT USED, THEN KALMAN
             FILTER HAS BEEN SET AUTOMATICALLY
             OFF BY THE SYSTEM.

Alert number 409:   POSITION SOURCE CHANGED      /5
             ------------------------------------
             POSITION SOURCE OF OWN SHIP PRIMARY
             POSITION HAS BEEN CHANGED
             AUTOMATICLLY TO ANOTHER SOURCE THAN
             BEFORE. VERIFY NEW SOURCE.
```

```
Alert number 410:   FILTER:POS SOURCE CHANGE   /5/12
             ------------------------------------
             DGPS POSITION SENSOR USED IN FILTER
             POSITIONING HAS CHANGED ITS
             OPERATION MODE FROM NORMAL TO
             DIFFERENTIAL OR FROM DIFFERENTIAL TO
             NORMAL

Alert number 411:   CHARTALING:OVER 30 MINUTES   /3
             ------------------------------------
             IF POSITION ALIGNMENT IS USED THEN
             USER IS REMINDED OF IT EVERY 30 MIN.

Alert number 412:   GYRO CORR. SOURCE CHANGED   /5
             ------------------------------------
             IF SOURCE OF GYRO CORRECTION IS
             CHANGED BY SYSTEM. CHECK THAT
             CORRECTION IS VALID.

Alert number 413:   SOG&COG DATA UNRELIABLE    /7/14
-------------------------------------------------------------
             SOG AND/OR COG DATA FROM SENSORS IS
             UNRELIABLE. VERIFY AND CHOOSE
             SPEED/COURSE AND POS SENSORS IN
             'SENSORS' FUNCTION. IF REASON IS
             FAST MANOUEVRE, LIMIT CAN BE
             INCREASED BY SETTING "MAX RATE OF
             TURN" LIMIT OVER 150 DEG/MIN.

Alert number 352:   ROUTE:ILLEGAL ETA WAYPOINT    /4
             ------------------------------------
             ETA WAYPOINT DOESN'T EXIST IN ROUTE
             FILE OR ETA WAYPOINT IS NOT BETWEEN
             NEXT AND FINAL WAYPOINT.
             VERIFY IN 'ROUTE MONITOR' THAT A
             VALID ROUTE IS CHOSEN.

Alert number 353:   ROUTE:ILLEGAL NEXT WAYPOINT   /4
             ------------------------------------
             NEXT WAYPOINT DOESN'T EXIST IN ROUTE
             FILE. VERIFY IN 'ROUTE MONITOR'
             THAT A VALID ROUTE IS CHOSEN.

Alert number 354:   ROUTE:ILLEGAL FINAL WAYPOINT  /4
             ------------------------------------
             FINAL WAYPOINT DOES NOT EXIST IN
             ROUTE FILE. VERIFY IN 'ROUTE MONI-
             TOR' THAT A VALID ROUTE IS CHOSEN.

Alert number 366:   MANUAL SPEED NOT SELECTED    /4
             ------------------------------------
             CHOOSE MANUAL SPEED IN SENSORS
             SPD/HDG PAGE.


Alert number 367:   MANUAL DRIFT DISABLED       /4
             ------------------------------------
             MANUAL DRIFT VALUE CAN ONLY BE
             INSERTED WHEN NO SENSORS PROVIDE
             SPEED OVER GROUND DATA.
             USE 'SENSORS' BUTTON TO VERIFY
             AND CHOOSE SENSORS TO BE USED.

Alert number 380:  USERCHART: FILE READ ERR    /4
             ------------------------------------
             CANNOT READ USER CHART IN MONITOR
             MODE. MOVE USER CHART TO PLAN MODE
             TO MAKE POSTPROCESSING AGAIN FOR
             USER CHART.
```

```
Alert number 381:  USER CHART: NEED POINTS      /4
                   ----------------------------------
                   USER CHART HAS MORE THAN 60 LINES OR
                   20 SYMBOLS AND IT DOES NOT CONTAIN
                   ANY POINTS. USE 'USER CHART' MENU
                   TO CHOOSE A VALID USER CHART OR ADD
                   POINTS TO CURRENT USER CHART

Alert number 382:  USERCHART: FILE NOT FOUND   /4
                   ----------------------------------
                   CANNOT READ USER CHART IN MONITOR
                   MODE. MOVE USER CHART TO PLAN MODE
                   TO MAKE POSTPROCESSING AGAIN FOR
                   USER CHART.

Alert number 390: ROUTE: FILE READ ERROR      /4
                   ----------------------------------
                   CANNOT OPEN ROUTE IN MONITOR MODE.
                   OPEN ROUTE IN PLAN MODE TO MAKE SOME
                   MODIFICATION OF WP DATA IN WP PAGE.
                   FOR EXAMPLE CHANGE RADIUS OF ANY WP.

Alert number 391: ROUTE: FILE READ ERROR      /4
                   ----------------------------------
                   CANNOT READ ROUTE IN MONITOR MODE.
                   MOVE ROUTE TO PLAN MODE TO MAKE SOME
                   MODIFICATION OF WP DATA IN WP PAGE.
                   FOR EXAMPLE CHANGE RADIUS OF ANY WP.

Alert number 392: ROUTE: FILE NOT FOUND       /4
                   ----------------------------------
                   CANNOT READ ROUTE IN MONITOR MODE.
                   MOVE ROUTE TO PLAN MODE TO MAKE SOME
                   MODIFICATION OF WP DATA IN WP PAGE.
                   FOR EXAMPLE CHANGE RADIUS OF ANY WP.

Alert number 454:   ROUTE: END REACHED        /3
                   ----------------------------------
                   YOU HAVE PASSED THE FINAL WAYPOINT
                   OF YOUR MONITORED ROUTE. CURRENT
                   MONITORED ROUTE HAS AUTOMATICALLY
                   CANCELLED
Alert number 457:   ROUTE: OUTSIDE CHANNEL LIMITS /2/9
                   ----------------------------------
                   SHIP IS OUTSIDE CHANNEL LIMITS
                   SPECIFIED FOR CURRENT LEG OF ROUTE.
                   CHECK SHIP POSITION AND ROUTE

Alert number 600:   PARAM CHANGE DISABLED       /3
                   ----------------------------------
                   INSTALLATION PARAMETERS CANNOT BE
                   CHANGED IF THE ROUTE STEERING IS ON
                   OR THE KALMAN FILTER IS IN USE.
                   CHECK THE SITUATION AND TRY AGAIN.

Alert number 601 PARAM CHANNEL CONFLICT          /4
                   ----------------------------------
                  IF IN INSTALLATION PARAMETERS THERE
                  ARE MORE THAN ONE DEVICE USING SAME
                  CHANNEL AND IF IN THAT CASE NO OTHER
                  DEVICES ARE ALLOWED FOR PARALLEL USE,
                  THEN ALERT 601 APPEARS.
                  NOTE: IN SOME SPECIAL CASE MORE THAN
                  ONE DEVICES CAN IN PARALLEL USE SAME
                  CHANNEL (FOR EXAMPLE LOG + DAX)
```

```
Alert number 630:   AIS TARGET OVERFLOW       /5/12
             ------------------------------------
             MAXIMUM COUNT OF AIS TARGETS SET TO
             BE DISPLAYED ON ECDIS HAS BEEN
             EXCEEDED WITHIN DEFINED MAXIMUM
             RANGE. IT IS POSSIBLE THAT SOME OF
             AIS TARGETS ARE NOT DISPLAYED ON
             ECDIS. TO GET ALL AIS TARGETS TO BE
             DISPLAYED, INCREASE MAXIMUM COUNT OF
             AIS TARGETS OR DECREASE VALUE OF
             MAXIMUM RANGE.

Alert number 631:   AIS TARGET STORAGE FULL     /5/12
             ------------------------------------
             MAXIMUM COUNT OF AIS TARGETS WHICH
             CAN BE STORED FOR DISPLAYING ON
             ECDIS HAS BEEN EXCEEDED. IT IS
             POSSIBLE THAT SOME OF AIS TARGETS
             ARE NOT DISPLAYED ON ECDIS.

Alert number 632:   AIS dangerous target      /2/9
             ------------------------------------
             AIS TARGET HAS MET DANGEROUS TARGET
             LIMIT SET BY CPA AND TCPA

Alert number 633:   AIS lost target             /5
             ------------------------------------
             NO Update INFORMATION RECEIVED FROM
             TRACKED AIS TARGET WITHIN DEFINED
             REPORTING INTERVAL OF SHIP TYPE

Alert number 634: AIS MESSAGE RECEIVED /3       634: AIS MESSAGE RECEIVED /10
             --------------------------------------------------------------
            AIS MESSAGE RECEIVED.               AIS MESSAGE RECEIVED.
            (When AIS message received          (When AIS message received
            alarm is enabled.)                  alarm is disabled.)

Alert number 635:   AIS TARGET IN ACQ ZONE   /5/13
             ------------------------------------
             AIS TARGET HAS ENTERED AN ACQ ZONE.

Alert number 636:   AIS DISPLAY 95% FULL     /6/13
             ------------------------------------
             WHEN 95% OF DISPLAY CAPACITY FOR AIS
             TARGETS ARE IN USE.

Alert number 637:   AIS DISPLAY 100% FULL    /5/12
             ------------------------------------
             WHEN 100% OF DISPLAY CAPACITY FOR AIS
             TARGETS ARE IN USE.

Alert number 638:   AIS STORAGE 95% FULL    /6/13
             ------------------------------------
             WHEN 95% OF STORAGE CAPACITY FOR AIS
             TARGETS ARE IN USE.

Alert number 639:   AIS STORAGE 100% FULL    /2/9
             ------------------------------------
             WHEN 100% OF STORAGE CAPACITY FOR AIS
             TARGETS ARE IN USE.

Alert number 700:   NO SENSOR PARAMETERS       /5
             ------------------------------------
             SENSOR PARAMETER FILES ARE MISSING.
             LOAD INSTALLATION PARAMETERS OF
             ECDIS. IF REQUIRED USE BACKUP COPY
             OF PARAMETERS.
```

```
Alert number 701:   B-ADAPTER ERROR        /6/13
             ------------------------------------
             B-ADAPTER DOES NOT OPERATE DUE TO A
             SYSTEM FAULT. SWITCH OFF MAIN
             CIRCUIT BREAKER AND THEN ON AGAIN.
             CALL SERVICE IF FAILURE STILL EXISTS

Alert number 705:   GYRO ERROR           /5/12
             ------------------------------------
             GYRO1 DATA IS NOT RECEIVED CORRECTLY
             USE 'INITIAL SETTINGS' MENU TO SET
             GYRO AGAIN. IF FAILURE STILL
             EXISTS, USE 'SENSORS' SPEED/POSITION
             PAGE TO CHOOSE VALID SENSORS.

Alert number 708:  LOG ERROR  /5/12          708:  DUAL AXIS LOG (WT) ERROR  /5/12
            ---------------------------------------------------------------
                 LOG DATA IS NOT RECEIVED         DUAL AXIS LOG DATA IS NOT RECEIVED
                 CORRECTLY                        CORRECTLY.
                 USE 'SENSORS' SPEED/COURSE       USE 'SENSORS' SPEED/COURSE
                 PAGE TO CHOOSE VALID             PAGE TO CHOOSE VALID
                  SENSORS.                        SENSORS.

Alert number 709:   DUAL AXIS LOG (BT) ERROR    /5/12
             ------------------------------------
             DUAL AXIS LOG DATA IS NOT RECEIVED
             CORRECTLY. USE SPEED/COURSE PAGE
             TO CHOOSE VALID SPEED SENSORS.

Alert number 710:   ECHO SOUNDER ERROR       /6/13
             ------------------------------------
             ECHO SOUNDER DATA IS NOT RECEIVED
             CORRECTLY.
             VERIFY ECHO SOUNDER OPERATION.

Alert number 711:   WIND SENSOR ERROR       /6/13
             ------------------------------------
             WIND SENSOR DATA IS NOT RE CEIVED
             CORRECTLY.
             VERIFY WIND SENSOR OPERATION.

Alert number 712:   POSITION EQUIPMENT ERROR    /5/12
             ------------------------------------
             POSITION EQUIPMENT 1 DATA IS NOT
             RECEIVED CORRECTLY. USE 'SENSORS'
             POSITION TO CHOOSE VALID POS SENSOR.

Alert number 713:   POSITION EQUIPMENT ERROR    /5/12
             ------------------------------------
             POSITION EQUIPMENT 2 DATA IS NOT
             RECEIVED CORRECTLY. USE 'SENSORS'
             POSITION TO CHOOSE VALID POS SENSOR.

Alert number 714:   POSITION EQUIPMENT ERROR    /5/12
             ------------------------------------
             POSITION EQUIPMENT 3 DATA IS NOT
             RECEIVED CORRECTLY. USE 'SENSORS'
             POSITION TO CHOOSE VALID POS SENSOR.

Alert number 715:   POSITION EQUIPMENT ERROR    /5/12
             ------------------------------------
             POSITION EQUIPMENT 4 DATA IS NOT
             RECEIVED CORRECTLY. USE 'SENSORS'
             POSITION TO CHOOSE VALID POS SENSOR.

Alert number 716:   POSITION EQUIPMENT ERROR    /5/12
             ------------------------------------
             POSITION EQUIPMENT 5 DATA IS NOT
             RECEIVED CORRECTLY. USE 'SENSORS'
             POSITION TO CHOOSE VALID POS SENSOR.
```

```
Alert number 718:   ROT GYRO ERROR        /5/12
             -----------------------------------
             ROT GYRO DATA IS NOT RECEIVED
             CORRECTLY. VERIFY ROT GYRO DEVICE.

Alert number 727:   DGPS POS. SOURCE CHANGE    /5/12
             -----------------------------------
             DGPS POSITION SENSOR IN CHANNEL
             NUMBER 1 HAS CHANGED ITS OPERATION
             MODE FROM NORMAL TO DIFFERENTIAL OR
             FROM DIFFERENTIAL TO NORMAL. CHECK
             SENSORS AND IF REQUIRED CHOOSE MORE
             SUITABLE POSITION SENSOR.

Alert number 728:   DGPS POS. SOURCE CHANGE    /5/12
             -----------------------------------
             DGPS POSITION SENSOR IN CHANNEL
             NUMBER 2 HAS CHANGED ITS OPERATION
             MODE FROM NORMAL TO DIFFERENTIAL OR
             FROM DIFFERENTIAL TO NORMAL. CHECK
             SENSORS AND IF REQUIRED CHOOSE MORE
             SUITABLE POSITION SENSOR.

Alert number 729:   DGPS POS. SOURCE CHANGE    /5/12
             -----------------------------------
             DGPS POSITION SENSOR IN CHANNEL
             NUMBER 3 HAS CHANGED ITS OPERATION
             MODE FROM NORMAL TO DIFFERENTIAL OR
             FROM DIFFERENTIAL TO NORMAL. CHECK
             SENSORS AND IF REQUIRED CHOOSE MORE
             SUITABLE POSITION SENSOR.

Alert number 730:   DGPS POS. SOURCE CHANGE    /5/12
             -----------------------------------
             DGPS POSITION SENSOR IN CHANNEL
             NUMBER 4 HAS CHANGED ITS OPERATION
             MODE FROM NORMAL TO DIFFERENTIAL OR
             FROM DIFFERENTIAL TO NORMAL. CHECK
             SENSORS AND IF REQUIRED CHOOSE MORE
             SUITABLE POSITION SENSOR.

Alert number 731:   DGPS POS. SOURCE CHANGE    /5/12
             -----------------------------------
             DGPS POSITION SENSOR IN CHANNEL
             NUMBER 5 HAS CHANGED ITS OPERATION
             MODE FROM NORMAL TO DIFFERENTIAL OR
             FROM DIFFERENTIAL TO NORMAL. CHECK
             SENSORS AND IF REQUIRED CHOOSE MORE
             SUITABLE POSITION SENSOR.

Alert Number 733:   ECHO REF SPEED ERROR    /5/12
             -----------------------------------
             RADAR SELECTED AS SPD AND CRS
             SOURCE IS NOT RECEIVED CORRECTLY.
             USE 'SENSORS' SPEED/COURSE TO SELECT
             VALID SPD/CRS SENSORS.

Alert number 735:   B-ADAPTER INTERFACE ERROR    /5/12
             -----------------------------------
             B-ADAPTER DATA IS NOT RECEIVED
             CORRECTLY DUE TO INTERNAL SOFTWARE
             ERROR IN COMMUNICATION PROGRAM.
             TO RESTART COMMUNICATION PROGRAM,
             OPEN INSTALLATION PARAMETERS OF
             ECDIS AND CLICK OK WITHOUT CHANGING
             ANY PARAMETERS. OR RESTART ECDIS.

Alert number 737:   AIS RECEIVE ERROR       /6/13
             -----------------------------------
             DATA FROM AMWSS IS NOT RECEIVED
             CORRECTLY. CHECK CONNECTION TO
             AMWSS
```

```
Alert number 738:   DATUM MISMATCH        /6/13
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 1
             OUTPUTS POSITION ANOTHER DATUM AS
             SET IN ECDIS INSTALLATION PARAMETERS
             CHECK, THAT SENSOR OUTPUTS POSITION
             IN WGS 84 DATUM.

Alert number 739:   DATUM MISMATCH        /6/13
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 2
             OUTPUTS POSITION ANOTHER DATUM AS
             SET IN ECDIS INSTALLATION PARAMETERS
             CHECK, THAT SENSOR OUTPUTS POSITION
             IN WGS 84 DATUM.

Alert number 740:   DATUM MISMATCH        /6/13
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 3
             OUTPUTS POSITION ANOTHER DATUM AS
             SET IN ECDIS INSTALLATION PARAMETERS
             CHECK, THAT SENSOR OUTPUTS POSITION
             IN WGS 84 DATUM.

Alert number 741:   DATUM MISMATCH        /6/13
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 4
             OUTPUTS POSITION ANOTHER DATUM AS
             SET IN ECDIS INSTALLATION PARAMETERS
             CHECK, THAT SENSOR OUTPUTS POSITION
             IN WGS 84 DATUM.

Alert number 742:   DATUM MISMATCH        /6/13
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 5
             OUTPUTS POSITION ANOTHER DATUM AS
             SET IN ECDIS INSTALLATION PARAMETERS
             CHECK, THAT SENSOR OUTPUTS POSITION
             IN WGS 84 DATUM.

Alert number 744:   DATUM CHANGE          /5
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 1
             HAS CHANGED OUTPUT POSITION FROM
             ANOTHER DATUM TO WGS 84 DATUM.

Alert number 745:   DATUM CHANGE          /5
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 2
             HAS CHANGED OUTPUT POSITION FROM
             ANOTHER DATUM TO WGS 84 DATUM.

Alert number 746:   DATUM CHANGE          /5
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 3
             HAS CHANGED OUTPUT POSITION FROM
             ANOTHER DATUM TO WGS 84 DATUM.

Alert number 747:   DATUM CHANGE          /5
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 4
             HAS CHANGED OUTPUT POSITION FROM
             ANOTHER DATUM TO WGS 84 DATUM.

Alert number 748:   DATUM CHANGE          /5
             ------------------------------------
             POSITION SENSOR IN CHANNEL NUMBER 5
             HAS CHANGED OUTPUT POSITION FROM
             ANOTHER DATUM TO WGS 84 DATUM.
```

```
Alert number 756:   AFT ECHO SOUNDER ERROR    /6/13
                ------------------------------------
                DATA FROM AFT ECHO SOUNDER IS NOT
                RECEIVED CORRECTLY. CHECK COMMUNI-
                CATION BETWEEN ECDIS AND ECHO SOUNDER.

Alert number 759:   LAN ADAPTER 1 ERROR     /6/13
                ------------------------------------
                LAN ADAPTER 1 IS NOT COMMUNICATING
                CORRECTLY. SWITCH POWER
                OFF/ON ON LAN ADAPTER 1.


Alert number 760:   LAN ADAPTER 2 ERROR     /6/13
                ------------------------------------
                LAN ADAPTER 2 IS NOT COMMUNICATING
                CORRECTLY. SWITCH POWER
                OFF/ON ON LAN ADAPTER 1.

Alert number 763:   CHART RADAR IP ERROR FOR LANADA     /5/12
                ------------------------------------
                IF CHART RADAR IP-ADDRESS FOR LAN ADAPTERS
                IS DIFFERENT BETWEEN WINDOWSXP CONTROL
                PANEL AND CHART RADAR

Alert number 764:   LAN FAIL FOR LAN ADAPTER    /5/12
                ------------------------------------
                UNEXPEXTED LAN ERROR -> MAYBE LAN
                CABLE OR HUB BROKEN/DISCONNECTED.
                ECDIS CONTINUE OPERATION WITHOUT
                INTERFACES. FIX THE PROBLEM AND
                RESTART THE CHART RADR. CHECK IP ADDRESSES

Alert number 765:   NO LAN ADAPTER INSTALLED      /5/12
                ------------------------------------
                INSTALLATION MISTAKE. "NO LAN
                ADAPTER(S) DEFINED.  INSTALL CHART RADAR
                SW AGAIN.

Alert number 766:   LAN ADAPTER 1 PARAM ERROR     /6/13
                ------------------------------------
                INSTALLATION MISTAKE. INSTALL CHART RADAR
                SW AGAIN.

Alert number 767:   LAN ADAPTER 2 PARAM ERROR     /6/13
                ------------------------------------
                INSTALLATION MISTAKE. INSTALL CHART RADAR
                SW AGAIN.

Alert number 770:   CHART RADAR IP ERROR FOR RADAR     /5/12
                ------------------------------------
                IF CHART RADAR IP-ADDRESS FOR LAN RADAR IS
                DIFFERENT BETWEEN WINDOWSXP CONTROL
                PANEL AND RADAR. CHECK IP ADDRESSES.

Alert number 771:   LAN FAIL FOR RADAR       /5/12
                ------------------------------------
                UNEXPEXTED LAN ERROR -> MAYBE LAN
                CABLE BROKEN/DISCONNECTED.
                FIX THE PROBLEM AND RESTART THE CHART RADAR.

Alert number 772:   LAN RADAR 1 CONN ERROR     /5/12
                ------------------------------------
                CHART RADAR FAILED TO COMMUNICATE WITH LAN
                RADAR 1. CHECK IP ADDRESSES BOTH FOR
                LAN RADAR ON CHART RADAR AND ON RADAR.

Alert number 773:   LAN RADAR 2 CONN ERROR     /5/12
                ------------------------------------
                CHART RADAR FAILED TO COMMUNICATE WITH LAN
                RADAR 2. CHECK IP ADDRESSES BOTH FOR
                LAN RADAR ON CHART RADAR AND ON RADAR.
```

```
Alert number 774:   LAN RADAR 3 CONN ERROR     /5/12
             ------------------------------------
             CHART RADAR FAILED TO COMMUNICATE WITH LAN
             RADAR 3. CHECK IP ADDRESSES BOTH FOR
             LAN RADAR ON CHART RADAR AND ON RADAR.

Alert number 775:   LAN RADAR 4 CONN ERROR     /5/12
             ------------------------------------
             CHART RADAR FAILED TO COMMUNICATE WITH LAN
             RADAR 4. CHECK IP ADDRESSES BOTH FOR
             LAN RADAR ON CHART RADAR AND ON RADAR.

Alert number 779:   LANADATER1 VERSION ERROR /6/13
             ------------------------------------
             VERSION OF LAN ADAPTER 1 SOFTWARE IS
             NOT THE SAME WITH CHART RADAR SOFTWARE.
             LOAD CORRECT VERSION OF SOFTWARE TO
             LAN ADAPTER.

Alert number 780:   LANADATER2 VERSION ERROR /6/13
             ------------------------------------
             VERSION OF LAN ADAPTER 2 SOFTWARE IS
             NOT THE SAME WITH CHART RADAR SOFTWARE.
             LOAD CORRECT VERSION OF SOFTWARE TO
             LAN ADAPTER.

Alert number 783:   LAN ADATER PARAM CONFLICT  /5/12
             ------------------------------------
             ID OF LAN ADAPTER ON CHART RADAR IS INCORRECT
             OR PARAMETER "F" ON LAN ADAPTER IS
             INCORRECT. CHECK THE PARAMETERS.

Alert number 788  SYSTEM FROZEN,                /3
             APPEARS AS AN EARLY WARNING INDICATION
             THAT THE SYSTEM MAY ENTER STATE OF FREEZE.
             IF THIS ALERT WILL BE GENERATED
             FREQUENTLY, CONTACT TO FURUNO SERVICE.

Alert number 798:   NAVTEX MESSGE RECEIVED   /3/10
             ------------------------------------
             NEW NAVTEX MESSAGE IS RECEIVED.

Alert number 809:   NO CPA/TCPA FOR AIS TARGET /2/9
             ------------------------------------
             CPA/TCPA OF AIS CANNOT BE CALCULATED.

Alert number 850:      NEW NOTES             /3
             NEW NOTES HAS BEEN ACTIVATED.
```

## 20.10.2 List of chart alerts

```
Alert number 860:      SAFETY CONTOUR      /2/9

Alert number 861:      AREAS TO BE AVOIDED   /5/12

Alert number 862:      USER CHART DANGER AREA  /5/12

Alert number 863:      TRAFFIC SEPARATION ZONE /5/12

Alert number 864:      INSHORE TRAFFIC ZONE   /5/12

Alert number 865:      RESTRICTED AREA     /5/12

Alert number 866:      CAUTION AREA       /5/12

Alert number 867:      OFFSHORE PRODUCTION AREA  /5/12

Alert number 868:      MILITARY PRACTICE AREA  /5/12

Alert number 869:      SEAPLANE LANDING AREA  /5/12

Alert number 870:      SUBMARINE TRANSIT LANE /5/12
```

```
Alert number 871:      ANCHORAGE AREA      /5/12

Alert number 872:      MARINE FARM/AQUACULTURE /5/12

Alert number 873:      PSSA AREA         /5/12

Alert number 874:      ANCHOR WATCH      /5/12
```

### 20.10.3 List of radar-related alerts

```
Alert number 100:   RADOV NO HEADLINE       6/13
                 ------------------------------------
                 NO HEADLINE AVAILABLE FOR RADAR
                 OVERLAY.  CHECK CONNECTORS AND
                 CABLING FOR RADAR OVERLAY

Alert number 101:   RADOV NO AZIMUTH        6/13
                 ------------------------------------
                 NO AZIMUTH  AVAILABLE FOR RADAR
                 OVERLAY.  CHECK CONNECTORS AND
                 CABLING FOR RADAR OVERLAY

Alert number 102:   RADOV NO TRIGGER        6/13
                 ------------------------------------
                 NO TRIGGER AVAILABLE FOR RADAR
                 OVERLAY.  CHECK CONNECTORS AND
                 CABLING FOR RADAR OVERLAY

Alert number 103:   RADOV NO VIDEO           /14
                 ------------------------------------
                 NO VIDEO AVAILABLE FOR RADAR
                 OVERLAY.  CHECK ADJUSTMENT OF GAIN ON
                 ON RADAR OVERLAY.  CHECK CONNECTORS
                 AND CABLING FOR RADAR OVERLAY

Alert number 104:   RADOV NO GYRO           6/13
                 ------------------------------------
                 NO HEADING REFERENCE AVAILABLE FOR
                 RADAR PROCESSOR WHICH IS SOURCE FOR
                 RADAR OVERLAY. CHECK ARPA PROCESSOR

Alert number 106:   LAN RADAR CONNECT FAILURE 5/12
                 ------------------------------------
                 FAILURE TO ESTABLISH LAN CONNECTION
                 FOR ARPA FEATURES BETWEEN ECDIS
                 PROCESSOR AND ARPA PROCESSOR.
                 CHECK LAN CONNECTORS AND CABLES
                 POWER ON/OFF AND REINSTALL ECDIS SW.

Alert number 107:   LAN RADAR DLL FAILURE   5/12
                 ------------------------------------
                 FAILURE INSIDE ECDIS PROCESSOR
                 BETWEEN DLL INTERFACE SW AND ECDIS
                 SOFTWARE. SWITCH POWER ON/OFF AND
                 REINSTALL ECDIS SW.

Alert number 108:   Watch Alarm             5/
                 ------------------------------------

Alert number 109:   RADOV NO ECHODATA       7/14
                 ------------------------------------
                 FAILURE TO RECEIVE RADAR ECHO DATA
                 FROM ARPA PROCESSOR OVER LAN
                 CONNECTION CHECK LAN CONNECTORS AND
                 CABLES. SWITCH POWER ON/OFF AND
                 REINSTALL ECDIS SW.

Alert number 110:      TT dangerous target    2/9

                                ---------------------------------------
```

```
Alert number 111:      TT Target in ACQ ZONE  6/13
                            ---------------------------------------

Alert number 112:      TT lost target         6/13
                            ---------------------------------------

Alert number 113:      Radar STBY Warning    13/13
                            ---------------------------------------

Alert number 114:      TT Auto ACQ 100% full  6/13
                            ---------------------------------------

Alert number 115:      TT Auto ACQ 95% full   7/14
                            ---------------------------------------

Alert number 116:      TT Man ACQ 100% full   6/13
                            ---------------------------------------

Alert number 117:      TT Man ACQ 95% full    7/14
                            ---------------------------------------

Alert number 118:      TT System error
                            ---------------------------------------

Alert number 119:      Radar CPU Warning     13/13
                            ---------------------------------------

Alert number 120:      TT lost REF target     6/13
                            ---------------------------------------
Alert number 200:   RADOV NO HEADLINE       6/13
             ------------------------------------
             NO HEADLINE AVAILABLE FOR RADAR
             OVERLAY.  CHECK CONNECTORS AND
             CABLING FOR RADAR OVERLAY

Alert number 201:   RADOV NO AZIMUTH        6/13
             ------------------------------------
             NO AZIMUTH  AVAILABLE FOR RADAR
             OVERLAY.  CHECK CONNECTORS AND
             CABLING FOR RADAR OVERLAY

Alert number 202:   RADOV NO TRIGGER        6/13
             ------------------------------------
             NO TRIGGER AVAILABLE FOR RADAR
             OVERLAY.  CHECK CONNECTORS AND
             CABLING FOR RADAR OVERLAY

Alert number 203:   RADOV NO VIDEO           /14
             ------------------------------------
             NO VIDEO AVAILABLE FOR RADAR
             OVERLAY.  CHECK ADJUSTMENT OF GAIN ON
             ON RADAR OVERLAY.  CHECK CONNECTORS
             AND CABLING FOR RADAR OVERLAY

Alert number 204:   RADOV NO GYRO           6/13
             ------------------------------------
             NO HEADING REFERENCE AVAILABLE FOR
             ARPA PROCESSOR WHICH IS SOURCE FOR
             RADAR OVERLAY. CHECK ARPA PROCESSOR

Alert number 206:   LAN RADAR CONNECT FAILURE 5/12
             ------------------------------------
             FAILURE TO ESTABLISH LAN CONNECTION
             FOR ARPA FEATURES BETWEEN ECDIS
             PROCESSOR AND ARPA PROCESSOR.
             CHECK LAN CONNECTORS AND CABLES
             POWER ON/OFF AND REINSTALL ECDIS SW.
```

Alert number 207: LAN RADAR DLL FAILURE 5/12
-------------------------------------
FAILURE INSIDE ECDIS PROCESSOR BETWEEN DLL INTERFACE SW AND ECDIS SOFTWARE. SWITCH POWER ON/OFF AND REINSTALL ECDIS SW.

Alert number 209: RADOV NO ECHODATA 7/14
-------------------------------------
FAILURE TO RECEIVE RADAR ECHO DATA FROM ARPA PROCESSOR OVER LAN CONNECTION CHECK LAN CONNECTORS AND CABLES. SWITCH POWER ON/OFF AND REINSTALL ECDIS SW.

Alert number 210: TT dangerous target 2/9
---------------------------------------

Alert number 211: TT Target in ACQ ZONE 6/13
---------------------------------------

Alert number 212: TT lost target 6/13
---------------------------------------

Alert number 213: Radar STBY Warning 13/13
---------------------------------------

Alert number 214: TT Auto ACQ 100% full 6/13
---------------------------------------

Alert number 215: TT Auto ACQ 95% full 7/14
---------------------------------------

Alert number 216: TT Man ACQ 100% full 6/13
---------------------------------------

Alert number 217: TT Man ACQ 95% full 7/14
---------------------------------------

Alert number 218: TT System error
---------------------------------------

Alert number 219: Radar CPU Warning 13/13
---------------------------------------

Alert number 220: TT lost REF target 6/13
---------------------------------------

Alert number 150: RADOV NO HEADLINE 6/13
-------------------------------------
NO HEADLINE AVAILABLE FOR RADAR OVERLAY. CHECK CONNECTORS AND CABLING FOR RADAR OVERLAY

Alert number 151: RADOV NO AZIMUTH 6/13
-------------------------------------
NO AZIMUTH AVAILABLE FOR RADAR OVERLAY. CHECK CONNECTORS AND CABLING FOR RADAR OVERLAY

Alert number 152: RADOV NO TRIGGER 6/13
-------------------------------------
NO TRIGGER AVAILABLE FOR RADAR OVERLAY. CHECK CONNECTORS AND CABLING FOR RADAR OVERLAY

```
Alert number 153:   RADOV NO VIDEO          /14
                 ------------------------------------
                 NO VIDEO AVAILABLE FOR RADAR
                 OVERLAY.  CHECK ADJUSTMENT OF GAIN ON
                 ON RADAR OVERLAY.  CHECK CONNECTORS
                 AND CABLING FOR RADAR OVERLAY

Alert number 154:   RADOV NO GYRO          6/13
                 ------------------------------------
                 NO HEADING REFERENCE AVAILABLE FOR
                 ARPA PROCESSOR WHICH IS SOURCE FOR
                 RADAR OVERLAY. CHECK ARPA PROCESSOR

Alert number 156:   LAN RADAR CONNECT FAILURE 5/12
                 ------------------------------------
                 FAILURE TO ESTABLISH LAN CONNECTION
                 FOR ARPA FEATURES BETWEEN ECDIS
                 PROCESSOR AND ARPA PROCESSOR.
                 CHECK LAN CONNECTORS AND CABLES
                 POWER ON/OFF AND REINSTALL ECDIS SW.

Alert number 157:   LAN RADAR DLL FAILURE   5/12
                 ------------------------------------
                 FAILURE INSIDE ECDIS PROCESSOR
                 BETWEEN DLL INTERFACE SW AND ECDIS
                 SOFTWARE. SWITCH POWER ON/OFF AND
                 REINSTALL ECDIS SW.

Alert number 159:   RADOV NO ECHODATA       7/14
                 ------------------------------------
                 FAILURE TO RECEIVE RADAR ECHO DATA
                 FROM ARPA PROCESSOR OVER LAN
                 CONNECTION CHECK LAN CONNECTORS AND
                 CABLES. SWITCH POWER ON/OFF AND
                 REINSTALL ECDIS SW.

Alert number 160:      TT dangerous target   2/9

                            ---------------------------------------

Alert number 161:      TT Target in ACQ ZONE 6/13

                            ---------------------------------------

Alert number 162:      TT lost target        6/13

                            ---------------------------------------

Alert number 163:      Radar STBY Warning   13/13

                            ---------------------------------------

Alert number 164:      TT Auto ACQ 100% full 6/13

                            ---------------------------------------

Alert number 166:      TT Man ACQ 100% full  6/13

                            ---------------------------------------

Alert number 168:      TT System error

                            ---------------------------------------

Alert number 169:      Radar CPU Warning    13/13

                            ---------------------------------------

Alert number 250:   RADOV NO HEADLINE       6/13
                 ------------------------------------
                 NO HEADLINE AVAILABLE FOR RADAR
                 OVERLAY.  CHECK CONNECTORS AND
                 CABLING FOR RADAR OVERLAY
```

```
Alert number 251:   RADOV NO AZIMUTH        6/13
                ------------------------------------
                NO AZIMUTH  AVAILABLE FOR RADAR
                OVERLAY.  CHECK CONNECTORS AND
                CABLING FOR RADAR OVERLAY

Alert number 252:   RADOV NO TRIGGER        6/13
                ------------------------------------
                NO TRIGGER AVAILABLE FOR RADAR
                OVERLAY.  CHECK CONNECTORS AND
                CABLING FOR RADAR OVERLAY

Alert number 253:   RADOV NO VIDEO           /14
                ------------------------------------
                NO VIDEO AVAILABLE FOR RADAR
                OVERLAY.  CHECK ADJUSTMENT OF GAIN ON
                ON RADAR OVERLAY.  CHECK CONNECTORS
                AND CABLING FOR RADAR OVERLAY

Alert number 254:   RADOV NO GYRO           6/13
                ------------------------------------
                NO HEADING REFERENCE AVAILABLE FOR
                ARPA PROCESSOR WHICH IS SOURCE FOR
                RADAR OVERLAY. CHECK ARPA PROCESSOR

Alert number 256:   LAN RADAR CONNECT FAILURE 5/12
                ------------------------------------
                FAILURE TO ESTABLISH LAN CONNECTION
                FOR ARPA FEATURES BETWEEN ECDIS
                PROCESSOR AND ARPA PROCESSOR.
                CHECK LAN CONNECTORS AND CABLES
                POWER ON/OFF AND REINSTALL ECDIS SW.

Alert number 257:   LAN RADAR DLL FAILURE   5/12
                ------------------------------------
                FAILURE INSIDE ECDIS PROCESSOR
                BETWEEN DLL INTERFACE SW AND ECDIS
                SOFTWARE. SWITCH POWER ON/OFF AND
                REINSTALL ECDIS SW.

Alert number 259:   RADOV NO ECHODATA       7/14
                ------------------------------------
                FAILURE TO RECEIVE RADAR ECHO DATA
                FROM ARPA PROCESSOR OVER LAN
                CONNECTION CHECK LAN CONNECTORS AND
                CABLES. SWITCH POWER ON/OFF AND
                REINSTALL ECDIS SW.

Alert number 260:      TT dangerous target   2/9
                          ---------------------------------------

Alert number 261:      TT Target in ACQ ZONE 6/13
                          ---------------------------------------

Alert number 262:      TT lost target        6/13
                          ---------------------------------------

Alert number 263:      Radar STBY Warning   13/13
                          ---------------------------------------

Alert number 264:      TT Auto ACQ 100% full 6/13
                          ---------------------------------------

Alert number 265:      TT Auto ACQ 95% full  7/14
                          ---------------------------------------

Alert number 266:      TT Man ACQ 100% full  6/13
                          ---------------------------------------
```

```
Alert number 267:      TT Man ACQ 95% full   7/14
                            ---------------------------------------

Alert number 268:      TT System error
                            ---------------------------------------

Alert number 269:      Radar CPU Warning    13/13
                            ---------------------------------------

Alert number 270:      TT lost REF target    6/13
                            ---------------------------------------
```

### 20.10.4 List of external sensor related alerts

An "ALR receive and ACK transmit" communication is available for every serial line of the chart radar. This is intended for sensors reporting to the chart radar. ALR message from the sensor includes information about alert on sensor.

The communication with the sensor is supervised and if fault is detected then alert "ALARM SENSOR LOST including number 70-85 (depending of serial channel) and source indication label (for example AIS, POS1, etc.) is created.

For example:

```
Alert number 70:   XXXX ALARM SENSOR LOST   /7/14
             ------------------------------------
             COMMUNICATION FAULT DETECTED WITH
             SENSOR CONNECTED TO CHANNEL 1.
Etc.

Alert number 90:   CALA OUTPUT CONN. LOST   /7/14
             ------------------------------------
             THE COMMUNICATION WITH CENTRAL ALERT
             MANAGEMENT IS SUPERVISED AND IF FAULT
             IS DETECTED.

Alert number XXXX: "XXXX"+"NUMBER"+"TEXT"   /7/14
             ------------------------------------
             FROM EXTERNAL SOURCE "XXXX" INDICATES
             SOURCE.
```

# 21. Common Reference System

## 21.1 Installation of System

**Note 1:** Special attention of following topics is required to maintain "Common Reference System"

**Note 2:**: Origin of common reference system is the conning position on vessel.

- The values of center and conning positions depend on size and geometry of the ship. .
- Offsets from antenna position to conning position of position sensors depend on the location of position sensor antennas.

Offsets from antenna position to conning position of radars depend on the location of radar antennas.

## 21.2 Reference Management

This radar is designed to comply with IEC 62388. The expected tolerance of the chart to radar picture is as shown below.

### *Measuring conditions*

**Own ship position:** North latitude, less than 70°, South latitude, less than 70°

**Measuring range:** 24 nm

**Target range:** 10-24 nm

**Target bearing:** ±5° bearing tolerance on 45°, 135°, 225° and 315°.

### *Maximum error range*

Range error: Less than 0.25 nm

Bearing error: Less than 1.0°

Note however that the following items must be properly adjusted to meet above conditions.

- **Timing** (Tx timing of radar echo). The procedure for adjustment is shown in "Adjustment of Sweep Timing" in the Installation Manual.
- **Heading** (Adjustment of radar echo heading). The procedure for adjustment is shown in s "Heading Alignment" in the Installation Manual.
- **Radar ANT position** (Center of radar image is the radar antenna position). Radar antenna position is input in the initial settings.
- **Conning position**
    - The chart radar uses position data fed from a GPS navigator to calculate the latitude and longitude position of the conning position.
    - GPS antenna position and conning position are entered in the initial settings to calculate offset.
    - The latitude and longitude position displayed at the upper right side of the screen is the latitude and longitude position of the conning position.
    - The latitude and longitude position shown on the SENSORS dialog box is raw position data fed from a GPS navigator.
    - The chart datum used by the chart radar is recorded in geodetic datum WGS-84; therefore, the geodetic datum setting on the GPS navigator must be WGS-84.
    - The center position of the range rings, EBL and VRM is the conning position; therefore their center position is different from the center position of the radar image.
    - The calculation reference for TT and AIS bearing and range, CPA, TCPA, etc. is the conning position.

- **Gyro data**
  - A gyrocompass is interfaced with the radar processor, however gyro data is fed to the chart processor via LAN.
  - Gyro data may be IEC 61162-2 serial data, or synchro or stepper signal fed through Gyro Converter GC-10.
  - Serial format gyro data is fed directly from a gyrocompass, thus adjustment of the heading indication on the chart radar is not necessary.
  - If synchro or stepper gyro data is fed to the chart radar, the heading indication on the chart radar must be adjusted to match that of the gyro. For the adjustment procedure, see section 2.3.
- **Speed data**
  - Speed may be input from SDME or GPS.
  - SDME may be single-axis water speed or dual-axis ground speed.
  - GPS may be used to input COG/SOG.
  - Ground speed may also be taken from TT reference target.
  - Speed is entered from the SENSORS dialog box. For details, see section 2.5 How to Input Your Ship's Speed.

# 22. Maintenance and Troubleshooting

Periodic checks and maintenance are important for proper operation of any electronic system. This chapter contains maintenance and troubleshooting instructions to be followed to obtain optimum performance and the longest possible life of the equipment. Before attempting any maintenance or troubleshooting procedure please review the safety information below. If you cannot restore normal operation after following the troubleshooting procedures do not attempt to check inside any unit; there are no user-serviceable parts inside. Any repair work should be referred to a qualified technician.

## ⚠ WARNING

**Do not open the equipment.**

Only qualified personnel should work inside the equipment.

**Turn off the radar power switch before servicing the antenna unit. Post a warning sign near the switch indicating it should not be turned on while the antenna unit is being serviced.**

Prevent the potential risk of being struck by the rotating antenna and exposure to RF radiation hazard.

**Wear a safety belt and hard hat wh working on the antenna unit.**

Serious injury or death can result if someone falls from the radar antenna mast.

**The radar antenna emits electromagnetic radio frequency (RF) energy which can be harmful, particularly to your eyes. Never look directly into the antenna aperture from a close distance while the radar is in operation or expose yourself to the transmitting antenna at a close distance.**

## NOTICE

**Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.**

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

## 22.1 Maintenance

Regular maintenance is essential to good performance. A regular maintenance program should be established and should at least include the items shown in the table below.

Maintenance schedule

| Interval | Check point | Check and measures | Remarks |
|---|---|---|---|
| When needed | FURUNO-supplied LCD monitor and processor units | Dust and dirt may be removed from these units with a soft cloth.<br>The LCD will in time accumulate a layer of dust that can dim the picture. Wipe the LCD carefully to prevent scratching, using tissue paper and an LCD cleaner. To remove stubborn dirt, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt. Change paper frequently so the dirt will not scratch the LCD. | Do not use chemical-based cleaners for cleaning. They can remove paint and markings. |
| | Filter on processor units | Clean the filter at the rear of the processor units if it is dusty. | |
| Once every 3 to 6 months | Cabling | Check that all cabling is firmly connected and is not damaged. | |
| Every 3 to 6 months | Exposed bolts and nuts of antenna unit | Exposed bolts and nuts are subject to corrosion. Further, they may loosen by vibration. | Check that bolts and nuts are securely fastened. Refasten if necessary. If corroded, clean and coat with anticorrosive sealant. |
| | Radiator | Dust, dirt and salt deposits on the radiator cause signal attenuation, resulting in loss of sensitivity. Wipe radiator with a freshwater-moistened cloth. | The radiator is made of fibreglass reinforced plastic. Therefore, do not used gasoline, benzene and the like to clean the radiator.<br>If the radiator is iced, use a wooden or plastic headed hammer to remove the ice. DO NOT use a steel hammer. |
| | Terminals, connectors | Check that all terminals and connectors on circuit boards are securely fastened. | Have a qualified technician check terminals and connectors. |
| 6 months to 1 year | Screws on terminal boards in processor units | Check that all screws are tightly fastened. | Have a qualified technician check screws. |

## 22.2 How to Replace Consumable Parts

The magnetron wears with age, and distant targets will not be displayed when the magnetron needs to be replaced. Have a qualified technician check the magnetron when distant targets are not displayed.

*Consumable parts*

| Parts | Type | Life expectancy | Remarks |
|---|---|---|---|
| **Antenna Unit** | | | |
| Antenna Motor | D8G-516 (24 rpm, X-band)<br>D8G-571 (42 rpm, X-band)<br>GOB-8222 (18/22 rpm, X-band)<br>RM-6585 (22 rpm, X-band)<br>RM-7398 (21/26 rpm, S-band)<br>RM-7435 (21/26 rpm, S-band)<br>RM-9519 (45 rpm, S-band)<br>RM-9520 (45 rpm, S-band) | Gear motor 10,000 hours | |
| Carbon brush | MG120-5X6X11 D8G (X-band) | 10,000 hours | Check for wear when replacing magnetron. Replace if worn. |
| Magnetron | MAF-1425B (X-band, 12 kW)<br>MG4010 (X-band, 12 kW)<br>MG5436 (X-band, 25 kW)<br>MG5223F (S-band, 30 kW) | 4,000 hours<br>4,000 hours<br>4,000 hours<br>7,000 hours | Check no. of hours used at Tx time. Reset time after replacement. |
| **Display Unit** | | | |
| Backlight Unit for Display Unit MU-201CE | 201LHS2F | 45,000 hours (25°C)<br>30,000 hours (50°C) | Replace when brilliance is uneven or too low. |
| Cold Cathode Fluorescent Lamp for Display Unit MU-231CE, MU-231 | FLCL-23 | 50,000 hours (25°C)<br>35,000 hours (50°C) | Replace when brilliance is uneven or too low. |
| **Processor Unit (EC-1000C)** | | | |
| Processor cooler assy. | 2806KL-04W-B69-B50 | 17,500 hours | |
| | ASYG-FAN-FU-HEATSINK | 60,000 hours | On CPU Board OP0100 |
| Chassis fan | AD0812LB-A73GL | 60,000 hours | |
| Lithium battery | CR2032 | Three years | |
| | CR-2450 | Ten years | On CPU Board OP0100 |
| Power supply unit | UPF250-AA-BG | 60,000 hours | |
| HDD | MHW2040AC | 20,000 hours | |

The expected life figures are typical values. Actual life depends on usage and ambient temperature.

## 22.3 How to Replace the Fuses

The fuse in the radar processor unit, display unit and chart processor units protects those units from overcurrent and internal fault. If the power cannot be turned on, check if a fuse has blown. If it has blown, find out the cause before replacing the fuse. If it blows again after replacement, contact your dealer for advice.

| Unit | Power supply | Fuse to use |
|---|---|---|
| **Radar Processor Unit** | | |
| Radar Processor Unit RPU-016 | 24 VDC | 20A |
| | 100-115 VAC | 10A |
| | 220-230 VAC | 5A |
| **Display Unit** | | |
| Display Unit MU-190 | 100-230 VAC | 1A |
| Display Unit MU-201CR | 100-230 VAC | 2A |
| | 24 VDC | 5A |
| Display Unit MU-231CR | 100-230 VAC | 2A |
| | 24 VDC | 6A |
| Display Unit MU-231 | 100-230 VAC | 1.5A |
| **Chart Processor Unit** | | |
| Chart Processor Unit EC-1000C | 100-230 VAC | 5A |

## 22.4 How to Replace the Batteries

### *Radar processor unit*

The GC (Gyro Converter) Board in the radar processor unit carries a battery that backs up data. The life of the battery is about five years. When the battery has expired, the self test results for the battery shows "NG". When this happens have a qualified technician replace the battery.

| Battery type | Code no. |
|---|---|
| CR 1/2 8.1 | 000-103-769 |

### *Chart processor unit*

The CPU Board (PCI-5S-RS-R40 or OP0100) in the chart processor unit contains a lithium battery that preserves data when the power is turned off. When the voltage of the battery is low the time is wrong, all default settings are restored, etc. When this occurs, have the battery replaced by a qualified technician, at your earliest convenience.

| CPU board type* | Battery type | Code no. |
|---|---|---|
| PCI-5S-RS-R40 | CR2032 | 000-159-662-10 |
| OP0100 | CR2450 | |

* Type depends on unit production

## 22.5 Troubleshooting

The troubleshooting table below provides common faults and the remedy with which to restore normal operation. If you cannot restore normal operation do not check inside the equipment - there are no user-serviceable parts inside.

*Radar troubleshooting*

| If… | Then… | Remedy |
|---|---|---|
| the power cannot be turned on | • power connector may have loosened.<br>• ship's mains is off.<br>• fuse has blown. | • Check connector.<br>• Check ship's mains.<br>• Replace fuse. |
| the power can be turned on but nothing appears on the display | • brilliance is too low.<br>• the ambient temperature is less than 0°C (32°F). | • Adjust brilliance.<br>• The heater is warming the chart processor unit. The display appears in approx. 10 minutes. |
| key doesn't beep when operated | • key beep is turned off. | • Turn on key beep from the menu. |
| Picture not updated or picture freeze. | • suspect video freeze. 30 seconds after the picture freezes the buzzer sounds, the **ALARM ACK** key blinks and alarm signal is output. | • Turn the power off and on again. |
| marks and noise appear but no echoes | • fuse may have blown. | • Check fuse in processor unit. |
| picture does not change even though range is changed. | • suspect faulty range key or video freeze. | • Hit the **RANGE** key several times. If nothing happens, turn the power on and off again. |
| only two index lines are displayed | • check index line interval setting. | • Refer to section 2.20 Parallel Index (PI) Lines for how to adjust index line interval. |
| range rings are not displayed | • range rings are turned off. | • Turn on the range rings from the Color menu. |
| ARP target is not tracked correctly | • sea surface reflections, etc. are masking ARP target. | • Adjust A/C SEA and A/C RAIN to suppress sea and rain clutters. |
| sensitivity is poor | • suspect 2$^{nd}$ trace echo or soiled radiator. | • Remove 2$^{nd}$ trace echo; clean radiator. |

*Chart troubleshooting*

| If… | Then… | Remedy |
|---|---|---|
| program won't start. "No connection to dongle. Have a nice day." appears | • dongle is not connected to USB port. | • Reinsert dongle. |
| monitored route is not displayed | • route is not selected.<br>• chart is not set to display on foremost chart layer. | • Select monitor route. |
| planned route is not displayed | • route is selected.<br>• planned route is not selected visible top on chart. | • Select route as planned.<br>• Open Route page Symbol Display menu and check desired planned route parts. |
| symbol of user chart cannot be erased | • "Enable changes" is not selected.<br>• symbols may be superimposed by one another. | • Select "Enable changes" in User Chart menu.<br>• Click **Delete** button on Symbol page several times. |
| position cannot be found | • sensors are not selected in SENSORS dialog box.<br>• LAN adapter cable may have loosened. | • Check sensor selections in SENSORS dialog box.<br>• Connect LAN adapter cable. |
| S57 chart cannot been moved or zoomed in or out | • S57 chart drawing process is frozen. | • Open Chart menu and select System in Chart menu.<br>• Select Restart drawing process in System menu. |
| past track is not displayed | • past track is not selected visible. | • Open Tracking page of Symbol Display menu and select Own ship past track to System. |
| monitored user chart is not displayed | • user chart is not selected visible.<br>• user chart display is selected for plan mode. | • Click User Chart on sidebar then select DISP of Monitor.<br>• Unselect user chart in plan mode. |
| user chart is not displayed on radar display | • user chart is not selected in monitor mode.<br>• system has failed to post process chart for radar.<br>• LAN adapter cable may have loosened. | • Select user chart in monitor mode.<br>• Close User Chart menu to activate post processing for user chart.<br>• Connect LAN adapter cable. |

## 22.6 Advanced-Level Troubleshooting

This section describes how to cure hardware and software troubles that should be carried out by qualified service personnel.

**Note:** This radar equipment contains complex modules in which fault diagnosis and repair down to component level are not practicable by users.

*Advanced troubleshooting*

| Problem | Probable causes or check points | Remedy |
|---|---|---|
| Power turned on but radar does not operate at all | 1) Blown fuse.<br>2) Mains voltage/polarity<br>3) Power supply board | 1) Replace blown fuse.<br>2) Correct wiring and input voltage.<br>3) Replace power supply board. |
| Brilliance adjusted but no picture | SPU board | Replace SPU board. |
| Antenna not rotating | 1) Antenna drive mechanism<br>2) Defective antenna drive motor relay (thermal relay K2, 200/220/380, 440/100 VAC) | 1) Replace antenna drive mechanism.<br>2) Press relay reset button. |
| Data and marks not displayed in Transmit status | SPU board | Replace SPU board. |
| Adjust GAIN with A/C SEA set at minimum. Marks and indications appear but no noise or echo | 1) IF amplifier<br>2) Signal cable between antenna and processor unit<br>3) Video amplifier board | 1) Replace IF amplifier.<br>2) Check continuity and isolation of coaxial cable.<br>**Note:** Disconnect the plug and lugs at both ends of coaxial cable before checking it by ohmmeter.<br>3) Check video coax line for secure connection. If connection is good, replace SPU board. |
| Marks, indications and noise appear but no echo (Transmission leak representing own ship position is absent) | 1) TX high voltage protection circuit has activated.<br>2) Magnetron<br>3) Modulator board<br>4) SPU board | 1) Reset power to restore normal operation.<br>2) Check magnetron current. Replace magnetron.<br>3) Replace modulator board.<br>4) Replace SPU board. |
| Picture not updated or picture freeze-up | 1) Bearing signal generator board (in antenna unit)<br>2) SPU board<br>3) Video freeze-up | 1) Check the connection of signal cables.<br>2) Replace SPU board.<br>3) Turn off and on the radar. |
| Incorrect orientation of picture | 1) SPU board<br>2) Gyro interface | 1) The message GYRO appears when the heading pulse is not received during standby.<br>2) Replace the gyro interface. |
| Cannot operate radar from on-screen boxes | SPU Board | Replace SPU Board. |

| Problem | Probable causes or check points | Remedy |
|---|---|---|
| Radar is properly tuned but poor sensitivity | 1) Deteriorated magnetron<br>2) Detuned MIC<br>3) Dirt on radiator face<br>4) Water ingress to the waveguide or other feeder line<br>5) Second trace echo rejection is ON | 1) With the radar transmitting on 48 nm range, check magnetron current. If current is below normal, magnetron may be defective. Replace it.<br>2) Check MIC detecting current. If it is below normal value, MIC may have become detuned. MIC must be tuned.<br>3) Clean the radiator surface.<br>4) Remove water from the feeder line.<br>5) Disable the second-trace echo rejector referring to section 2.24 How to Suppress Second-trace Echoes. |
| Range changed but radar picture not changing | 1) Defective range key<br>2) SPU board<br>3) Video freeze up | 1) Try to hit RANGE [+] and [-] keys several times. If unsuccessful, replacement of keypad may be required.<br>2) Replace SPU board.<br>3) Turn off and on radar. |
| Interference rejector is inoperative (interference rejection level not displayed) | SPU board | Replace SPU board. |
| Echo stretch is ineffective (neither ES1, ES2 nor ES3 is displayed) | SPU board | Replace SPU board. |
| Range rings are not displayed | 1) Adjust the brilliance of range rings on the BRILL menu to see if intensity increases.<br>2) SPU board | 1) Replace associated circuit board if unsuccessful.<br>2) Replace SPU board. |
| Poor discrimination in range | Sea clutter control not functioning properly | Improper setting of A/C SEA. If A/C SEA is seen only at very close range, suspect inaccurate frequency of reference oscillator. |
| True motion presentation not working correctly | 1) Poor contact of **MODE** key (full keyboard)<br>2) Selection not accessed.<br>3) Speed entry incorrect<br>4) TM display inaccurate | 1) Try to press **MODE** key a little harder.<br>2) Press **MODE** key or operate PRESENTATION MODE box until TM appears.<br>3) Enter correct own ship speed referring to section 2.5 How to Input Your Ship's Speed.<br>4) Make sure that speed and compass inputs are accurate. |
| Target not tracked correctly | Poor definition of targets in sea clutter | Adjust A/C SEA and A/C RAIN controls referring to section 2.8 How to Suppress Sea Clutter and 2.9 How to Suppress Rain Clutter. |
| Buttons on trackball module operated but no response | Trackball module | Replace trackball module. |
| Power turned on but radar does not operate at all | 1) Blown fuse.<br>2) Mains voltage/polarity<br>3) Power supply board | 1) Replace blown fuse.<br>2) Correct wiring and input voltage.<br>3) Replace power supply board. |
| Brilliance adjusted but no picture | SPU board | Replace SPU board. |

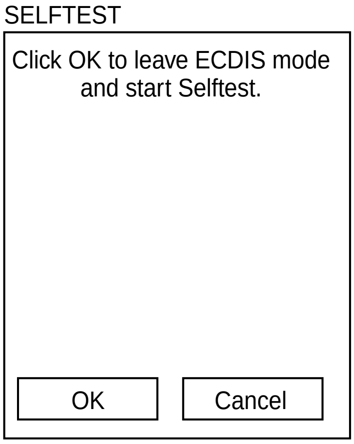
| Problem | Probable causes or check points | Remedy |
|---|---|---|
| Antenna not rotating | 1) Antenna drive mechanism<br>2) Defective antenna drive motor relay (thermal relay K2, 200/220/380, 440/100 VAC) | 1) Replace antenna drive mechanism.<br>2) Press relay reset button. |
| Data and marks not displayed in Transmit status | SPU board | Replace SPU board. |
| Adjust GAIN with A/C SEA set at minimum. Marks and indications appear but no noise or echo | 1) IF amplifier<br>2) Signal cable between antenna and processor unit<br>3) Video amplifier board | 1) Replace IF amplifier.<br>2) Check continuously and isolation of coaxial cable.<br>**Note:** Disconnect the plug and lugs at both ends of coaxial cable before checking it by ohmmeter.<br>3) Check video coax line for secure connection. If connection is good, replace SPU board. |
| Marks, indications and noise appear but no echo (Transmission leak representing own ship position is absent) | 1) TX fuse<br>2) Magnetron<br>3) Modulator board<br>4) SPU board | 1) If fuse is blown, replace it. If it blows again, the modulator or associated circuit may be defective.<br>2) Check magnetron current. Replace magnetron.<br>3) Replace modulator board.<br>4) Replace SPU board. |
| Picture not updated or picture freeze-up | 1) Bearing signal generator board (in antenna unit)<br>2) SPU board<br>3) Video freeze-up | 1) Check the connection of signal cables.<br>2) Replace SPU board.<br>3) Turn off and on the radar. |
| Incorrect orientation of picture | 1) SPU board<br>2) Gyro interface | 1) The message GYRO appears when the heading pulse is not received during standby.<br>2) Replace the gyro interface. |
| Incorrect orientation of picture | 1) SPU board<br>2) Gyro interface | 1) The message GYRO appears when the heading pulse is not received during standby.<br>2) Replace the gyro interface. |
| Cannot operate radar from on-screen boxes | SPU Board | Replace SPU Board. |

| Problem | Probable causes or check points | Remedy |
|---|---|---|
| Radar is properly tuned but poor sensitivity | 1) Deteriorated magnetron<br>2) Detuned MIC<br>3) Dirt on radiator face<br>4) Water ingress to the waveguide or other feeder line<br>5) Second trace echo rejection is ON | 1) With the radar transmitting on 48 nm range, check magnetron current. If current is below normal, magnetron may be defective. Replace it.<br>2) Check MIC detecting current. If it is below normal value, MIC may have become detuned. MIC must be tuned.<br>3) Clean the radiator surface.<br>4) Remove water from the feeder line.<br>5) Disable the second-trace echo rejector referring to section 2.24 How to Suppress Second-trace Echoes. |
| Range changed but radar picture not changing | 1) Defective range key<br>2) SPU board<br>3) Video freeze-up | 1) Try to hit **RANGE** key several times. If unsuccessful, replacement of keypad may be required.<br>2) Replace SPU board.<br>3) Turn off and on radar. |
| Interference rejector is inoperative (interference rejection level not displayed) | SPU board | Replace SPU board. |
| Echo stretch is ineffective (neither ES1, ES2 nor ES3 is displayed) | SPU board | Replace SPU board. |
| Range rings are not displayed | 1) Adjust the brilliance of range rings on the BRILL menu to see if intensity is increased<br>2) SPU board | 1) Replace associated circuit board if unsuccessful.<br>2) Replace SPU board. |
| Poor discrimination in range | Sea clutter control not functioning properly | Improper setting of A/C SEA. If A/C SEA is seen only at very close range, suspect inaccurate frequency of reference oscillator. |
| True motion presentation not working correctly | 1) Poor contact of **MODE** key (full keyboard)<br>2) Selection not accessed.<br>3) Speed entry incorrect<br>4) TM display inaccurate | 1) Try to press **MODE** key a little harder.<br>2) Press **MODE** key or operate PRESENTATION MODE box until TM appears.<br>3) Enter correct own ship speed referring to section 2.5 How to Input Your Ship's Speed.<br>4) Make sure that speed and compass inputs are accurate. |
| Target not tracked correctly | Poor definition of targets in sea clutter | Adjust A/C SEA and A/C RAIN controls referring to section 2.8 How to Suppress Sea Clutter and 2.9 How to Suppress Rain Clutter. |
| Buttons on trackball module operated but no response | Trackball module | Replace trackball module. |

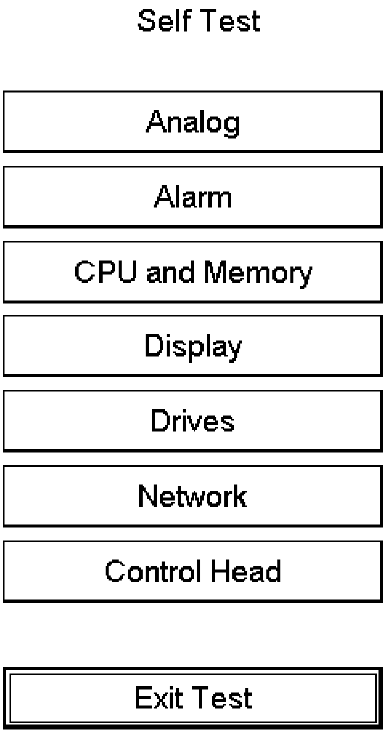
## 22.7 Keyboard Test

In addition to the color calibration tests, the system provides a keyboard test that the operator may use to check keyboard of the RCU-020. (Other diagnostic tests are also provided, on the self test menu, however these are intended for service technicians. For further details, see the service manual.)

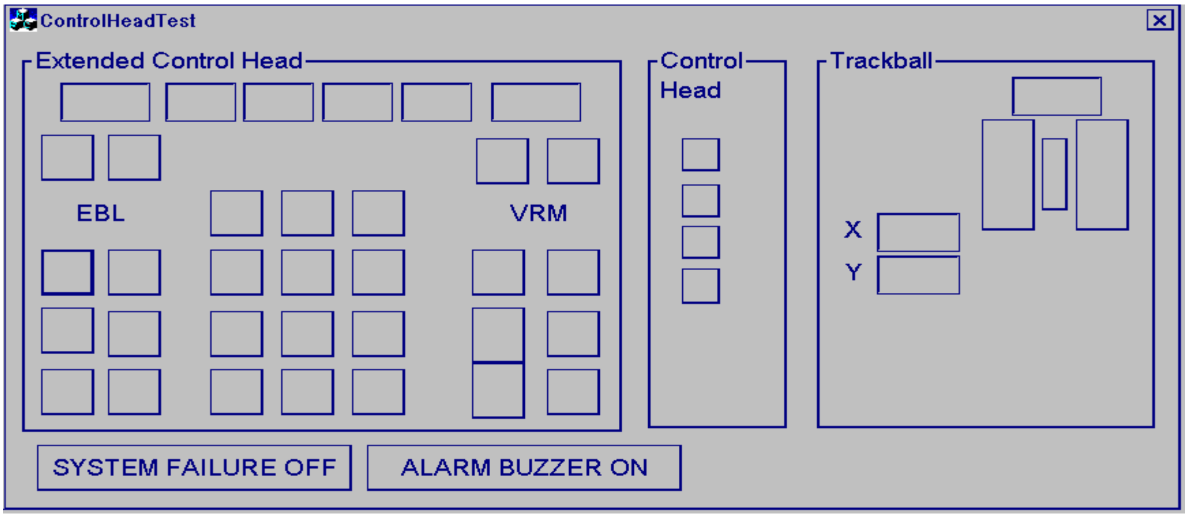
1. Spin the scrollwheel to show Menu/Info/Chart Menu in the guidance area, then push the left button.
2. Select the Initial Setting menu.
3. Put the cursor on the triangle in the menu to show the Initial Settings menu.
4. Select Self Test. You are asked if it is OK to leave the chart radar mode and start the self test.




5. Click the **OK** button to show the self test menu.



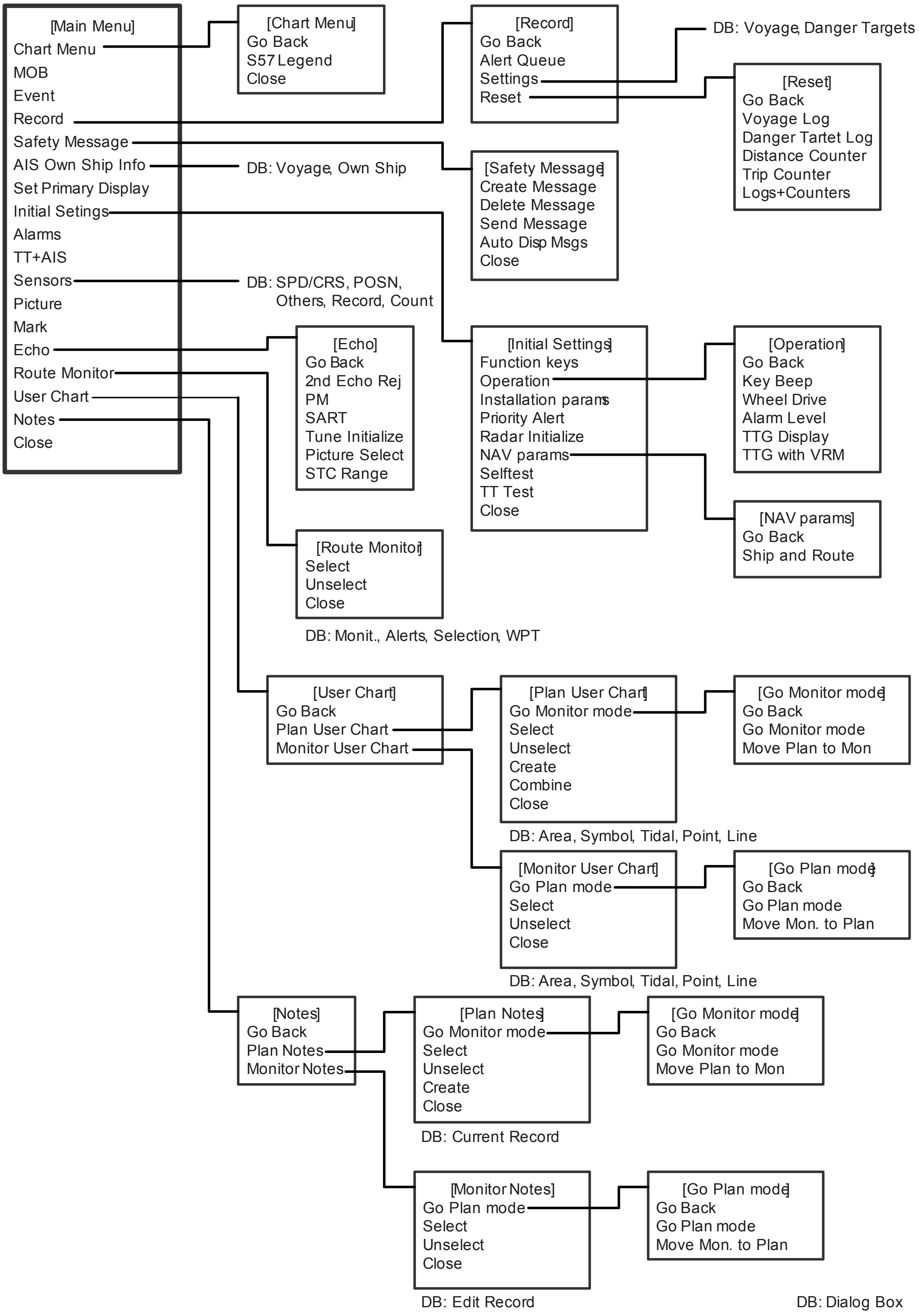
6. Click the **Control Head** button to show the control head checking screen.



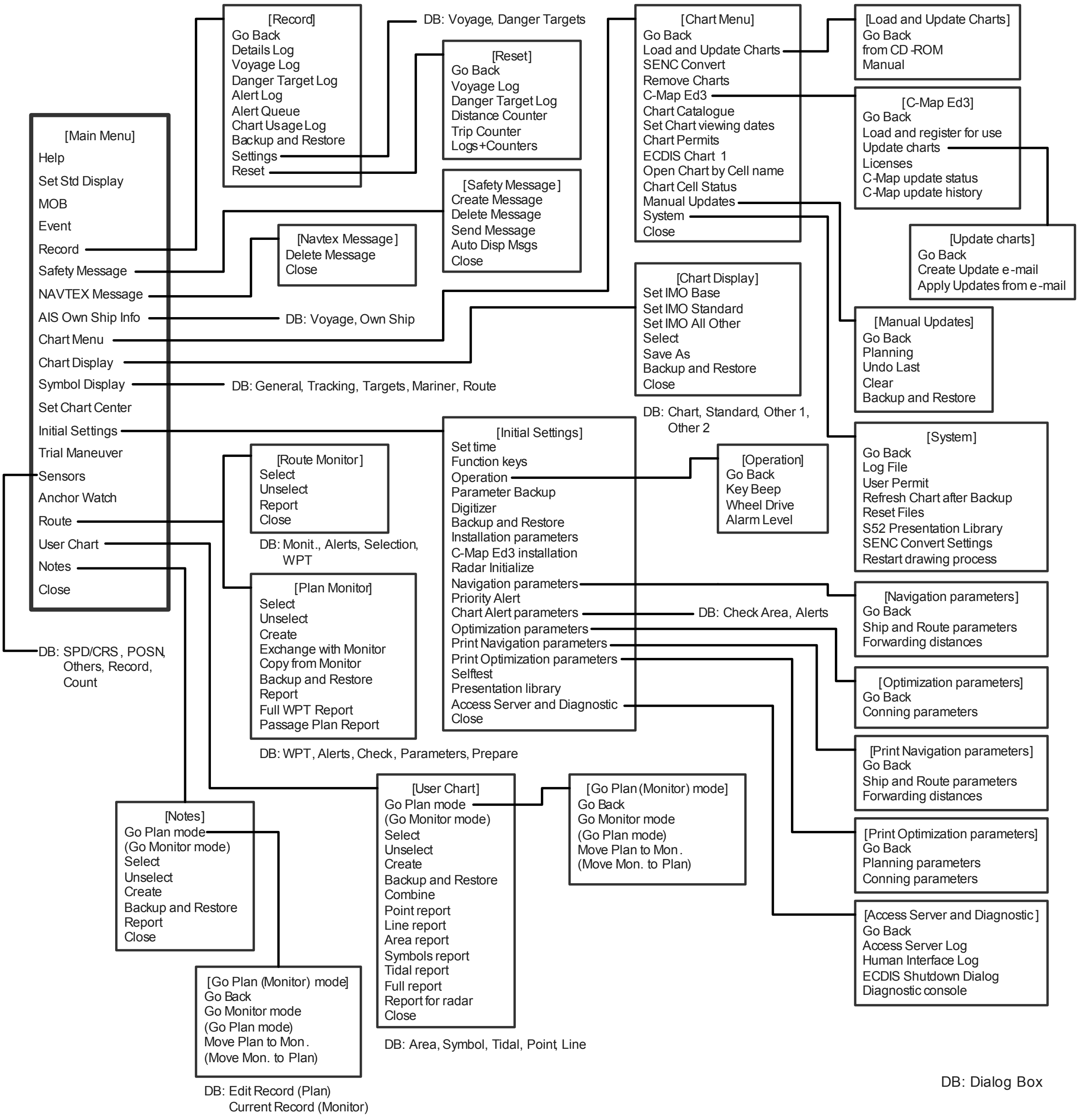

7. Push each key, button and scrollwheel. The perimeter of the on-screen key, button or scrollwheel blackens if the pushed item is functioning normally. (For the palm control-type Control Unit, push the hot keys; their on-screen location is in the control unit window.)
8. Operate radar-related controls (EBL and VRM rotary encoders, A/C RAIN, A/C SEA and GAIN). The figure in the corresponding on-screen location becomes larger or smaller with control operation.
9. Operate the trackball. The trackball's X and Y location is shown in the X and Y boxes.
10. Spin the scrollwheel. Confirm that the figure in the box above the scrollwheel's on-screen location becomes larger or smaller with scrollwheel operation.
11. Click the **ALARM BUZZER ON** button. Confirm that the buzzer sounds. Click the button again to silence the buzzer.
12. Click the **SYSTEM FAILURE OFF** button. Thirty seconds after the button is clicked the buzzer sounds and the **SYSTEM FAILURE** key flashes. Click the button again to stop the flashing and silence the buzzer.
13. Click the **Exit Test** button to quit the test.

# Appendix 1: Menu Overview

## Radar/Chart Radar Menu



# ECDIS Menu

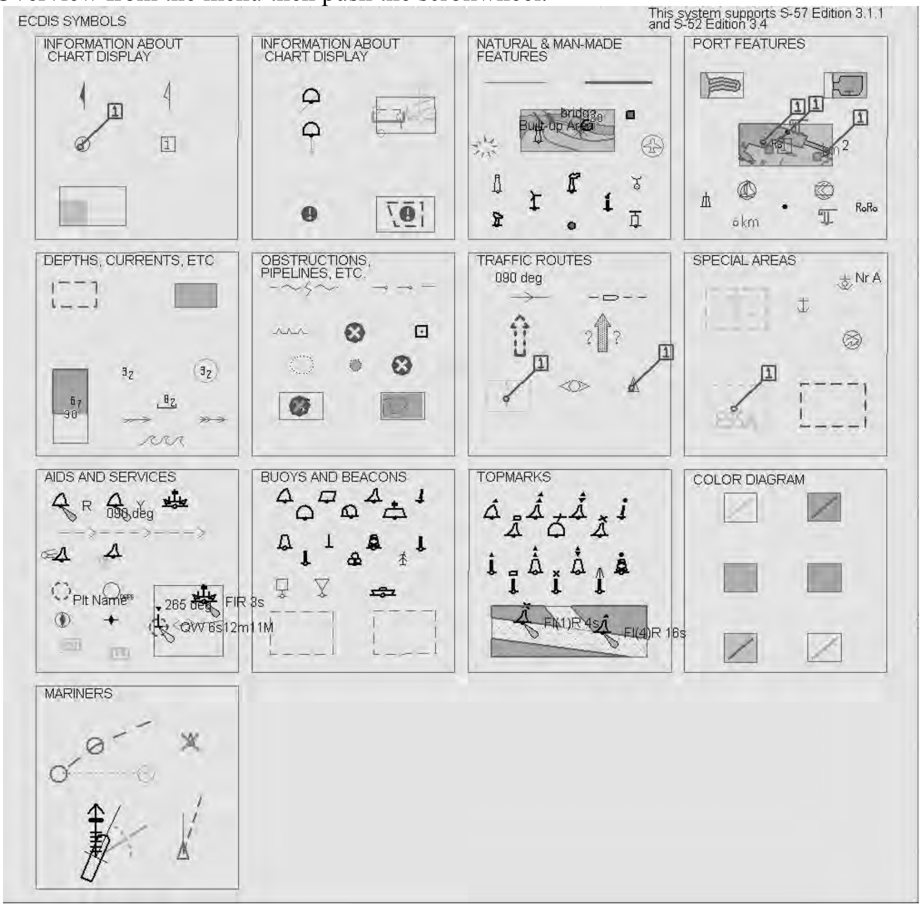

[Main Menu]
Help
Set Std Display
MOB
Event
Record
Safety Message
NAVTEX Message
AIS Own Ship Info
Chart Menu
Chart Display
Symbol Display
Set Chart Center
Initial Settings
Trial Maneuver
Sensors
Anchor Watch
Route
User Chart
Notes
Close
DB: SPD/CRS, POSN, Others, Record, Count
[Record]
Go Back
Details Log
Voyage Log
Danger Target Log
Alert Log
Alert Queue
Chart Usage Log
Backup and Restore
Settings
Reset
DB: Voyage, Danger Targets
[Reset]
Go Back
Voyage Log
Danger Target Log
Distance Counter
Trip Counter
Logs+Counters
[Safety Message]
Create Message
Delete Message
Send Message
Auto Disp Msgs
Close
[Navtex Message]
Delete Message
Close
DB: Voyage, Own Ship
DB: General, Tracking, Targets, Mariner, Route
[Chart Menu]
Go Back
Load and Update Charts
SENC Convert
Remove Charts
C-Map Ed3
Chart Catalogue
Set Chart viewing dates
Chart Permits
ECDIS Chart 1
Open Chart by Cell name
Chart Cell Status
Manual Updates
System
Close
[Load and Update Charts]
Go Back
from CD-ROM
Manual
[C-Map Ed3]
Go Back
Load and register for use
Update charts
Licenses
C-Map update status
C-Map update history
[Update charts]
Go Back
Create Update e-mail
Apply Updates from e-mail
[Chart Display]
Set IMO Base
Set IMO Standard
Set IMO All Other
Select
Save As
Backup and Restore
Close
DB: Chart, Standard, Other 1, Other 2
[Manual Updates]
Go Back
Planning
Undo Last
Clear
Backup and Restore
[System]
Go Back
Log File
User Permit
Refresh Chart after Backup
Reset Files
S52 Presentation Library
SENC Convert Settings
Restart drawing process
[Initial Settings]
Set time
Function keys
Operation
Parameter Backup
Digitizer
Backup and Restore
Installation parameters
C-Map Ed3 installation
Radar Initialize
Navigation parameters
Priority Alert
Chart Alert parameters
Optimization parameters
Print Navigation parameters
Print Optimization parameters
Selftest
Presentation library
Access Server and Diagnostic
Close
DB: Check Area, Alerts
[Operation]
Go Back
Key Beep
Wheel Drive
Alarm Level
[Navigation parameters]
Go Back
Ship and Route parameters
Forwarding distances
[Optimization parameters]
Go Back
Conning parameters
[Print Navigation parameters]
Go Back
Ship and Route parameters
Forwarding distances
[Print Optimization parameters]
Go Back
Planning parameters
Conning parameters
[Access Server and Diagnostic]
Go Back
Access Server Log
Human Interface Log
ECDIS Shutdown Dialog
Diagnostic console
[Route Monitor]
Select
Unselect
Report
Close
DB: Monit., Alerts, Selection, WPT
[Plan Monitor]
Select
Unselect
Create
Exchange with Monitor
Copy from Monitor
Backup and Restore
Report
Full WPT Report
Passage Plan Report
DB: WPT, Alerts, Check, Parameters, Prepare
[User Chart]
Go Plan mode
(Go Monitor mode)
Select
Unselect
Create
Backup and Restore
Combine
Point report
Line report
Area report
Symbols report
Tidal report
Full report
Report for radar
Close
DB: Area, Symbol, Tidal, Point, Line
[Go Plan (Monitor) mode]
Go Back
Go Monitor mode
(Go Plan mode)
Move Plan to Mon.
(Move Mon. to Plan)
[Notes]
Go Plan mode
(Go Monitor mode)
Select
Unselect
Create
Backup and Restore
Report
Close
[Go Plan (Monitor) mode]
Go Back
Go Monitor mode
(Go Plan mode)
Move Plan to Mon.
(Move Mon. to Plan)
DB: Edit Record (Plan)
Current Record (Monitor)
DB: Dialog Box

# Appendix 2: IHO ECDIS Chart 1

International Hydrographic Organization (IHO) has published a set of charts where you can find examples of symbology used in S57 charts. You can study them by using the "Info/Help" feature and by switching different layers ON and OFF in the Chart Display dialog box. Everything is visible if you set all layers for "Standard" or "Other" in the Other 1 and Other 2 pages in the Chart Display dialog box.

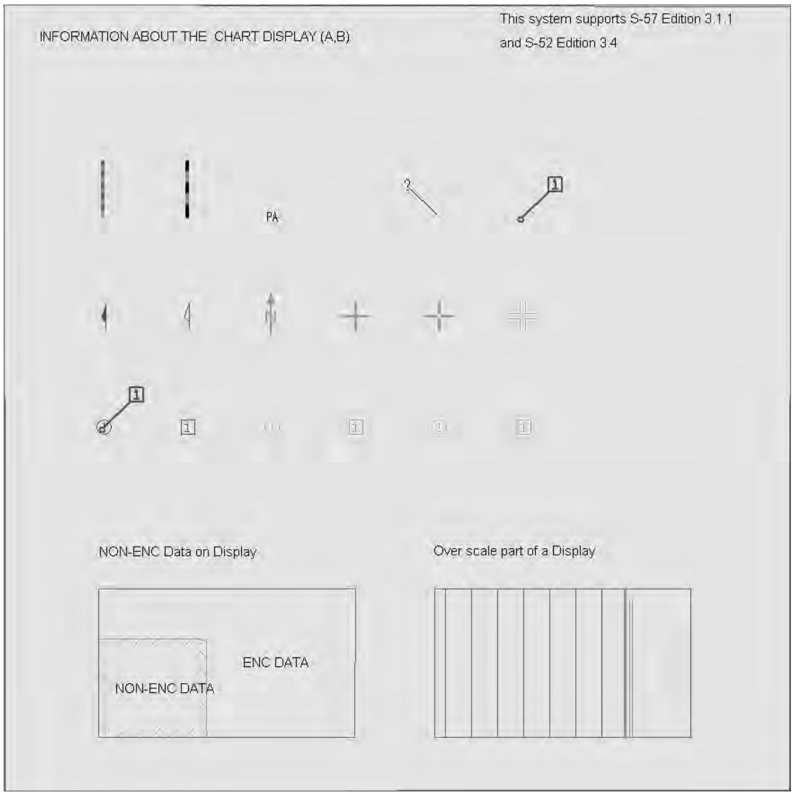
To open the IHO ECDIS Chart 1on the display, do the following:

1. Spin the scrollwheel to show Menu/Info/Chart Menu in the mouse functions area then push the right mouse button.
2. Roll the wheel to choose ECDIS Chart 1 from the menu then push the scrollwheel.
3. Choose Overview from the menu then push the scrollwheel.

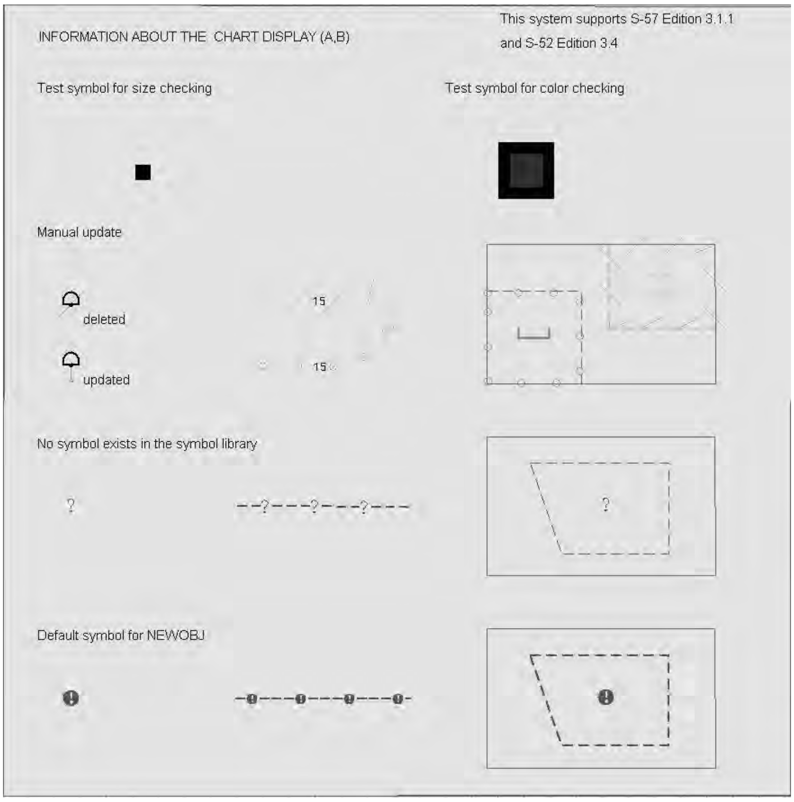



4. Spin the scrollwheel to choose desired item then push the scrollwheel.

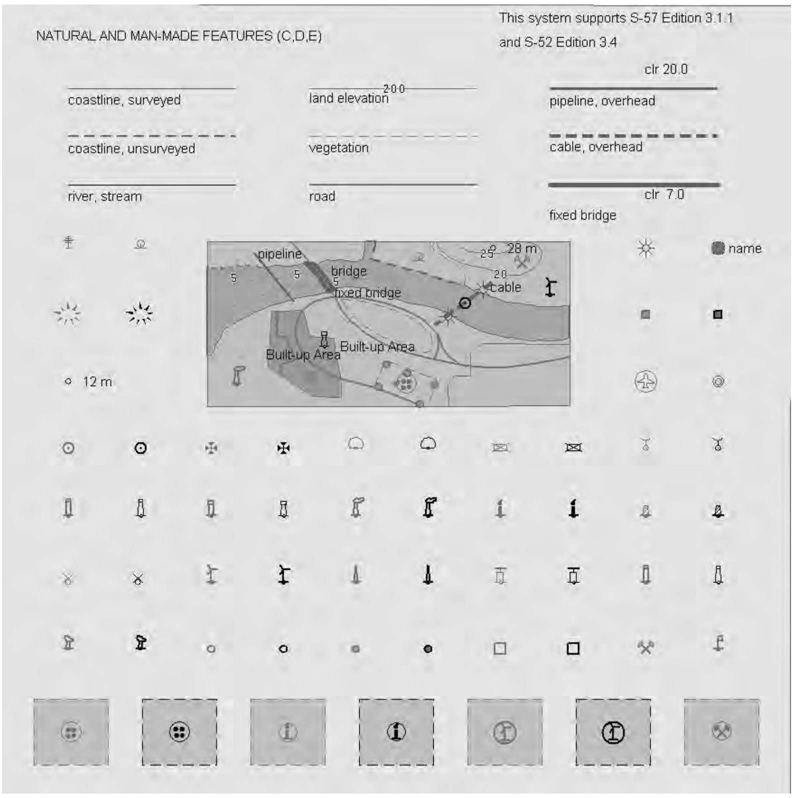
See the next several pages for the display associated with each dialog box item.



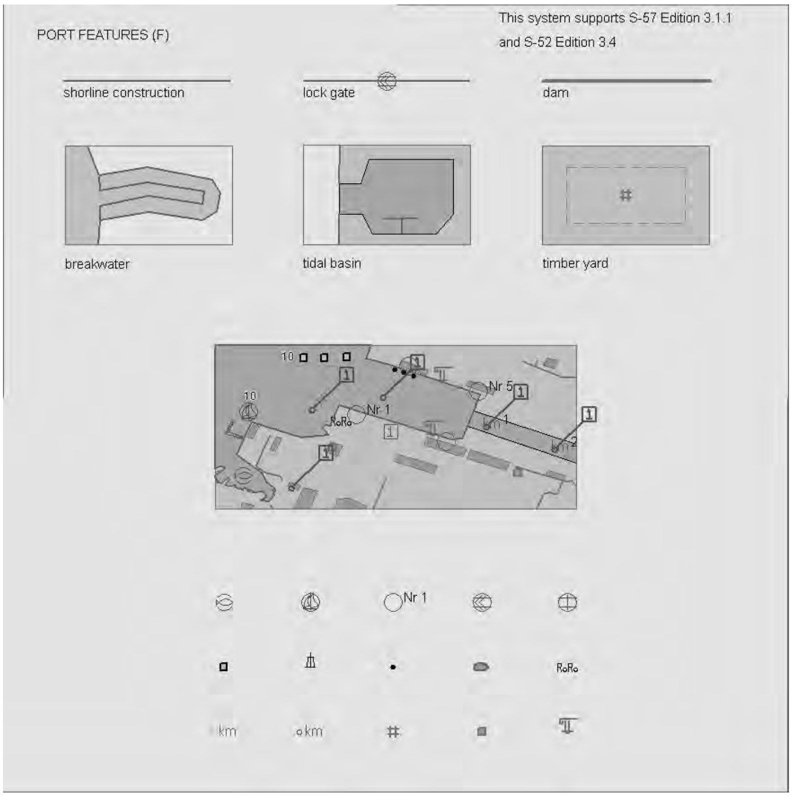

*Information about the chart display 1*



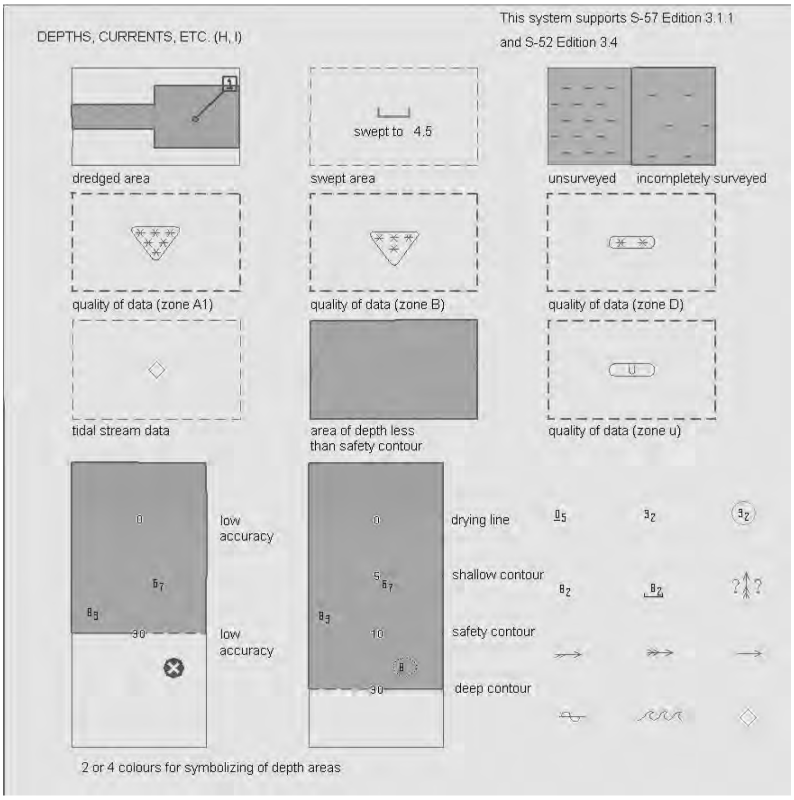

*Information about the chart display 2*



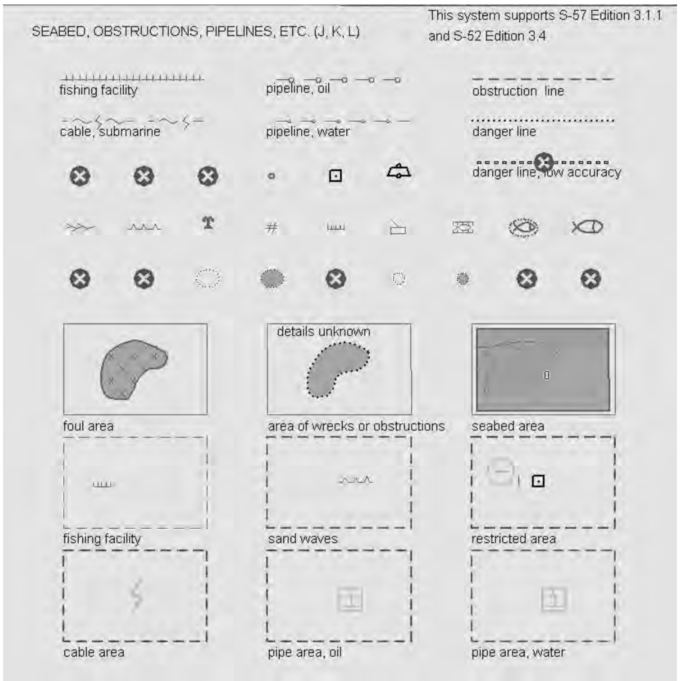

*Nature and Man-made features*



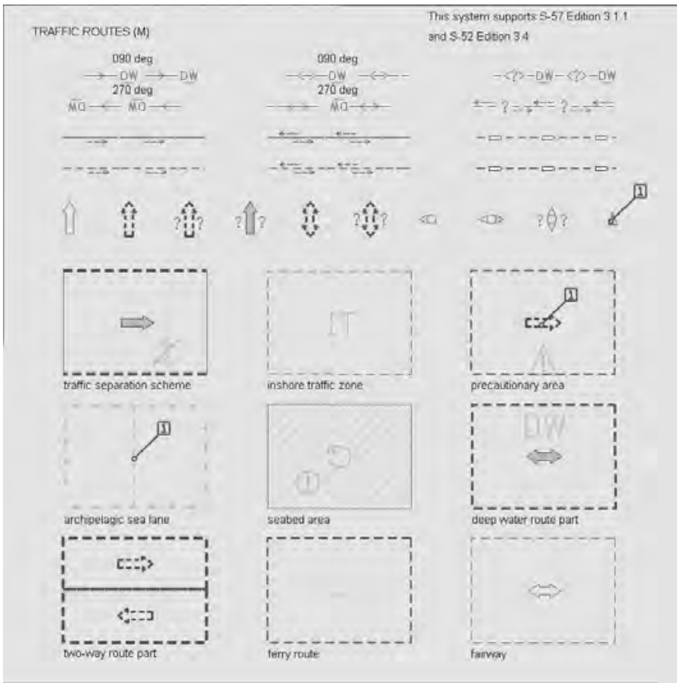

*Port features*



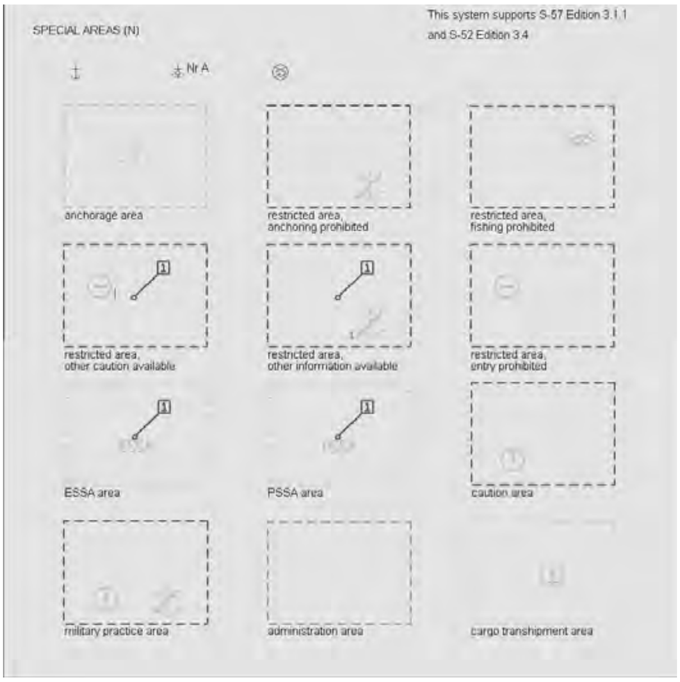

*Depths, Currents, etc.*



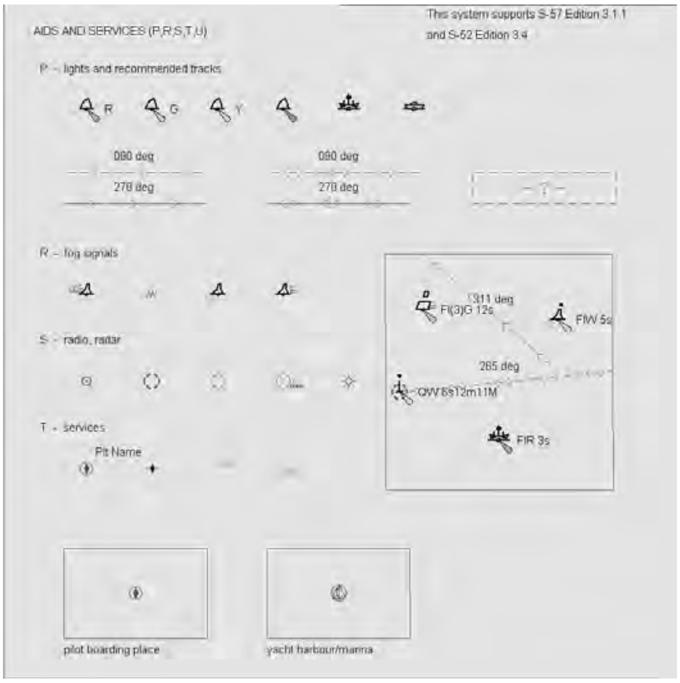

*Seabed, Obstructions, Pipelines, etc.*



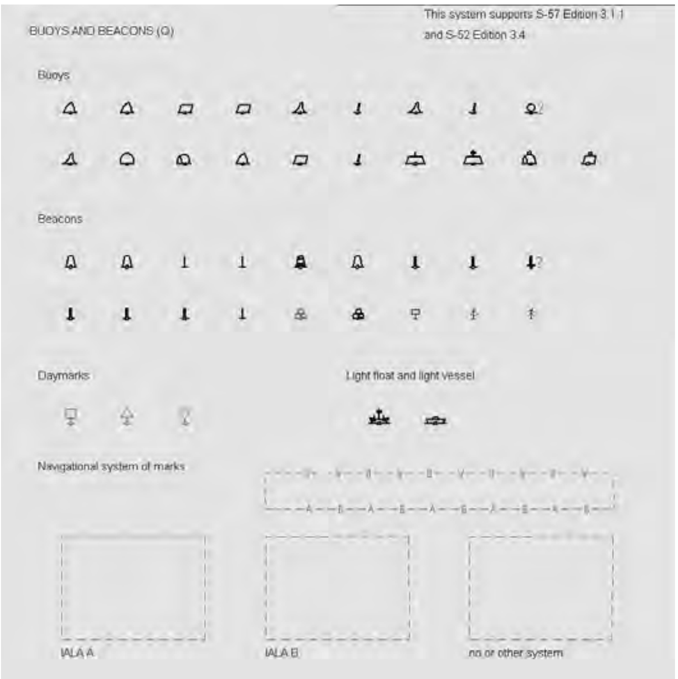
*Traffic routes*



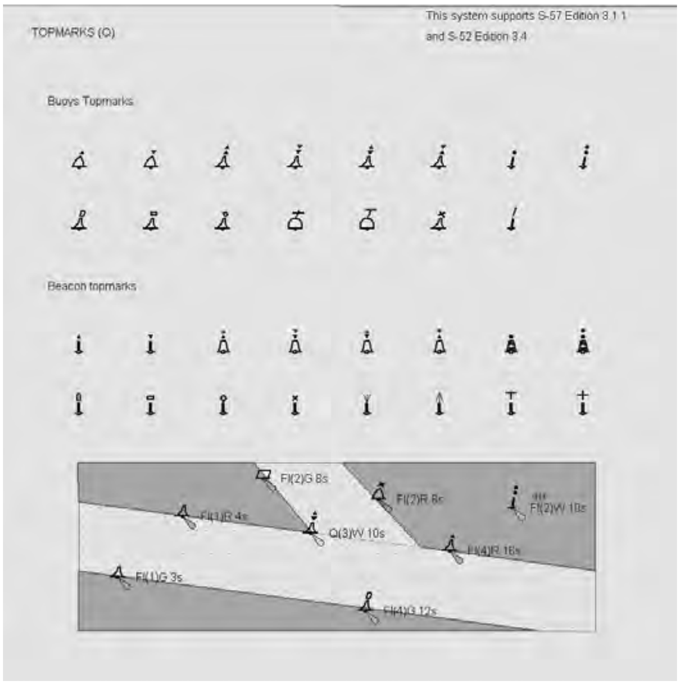
*Special areas*



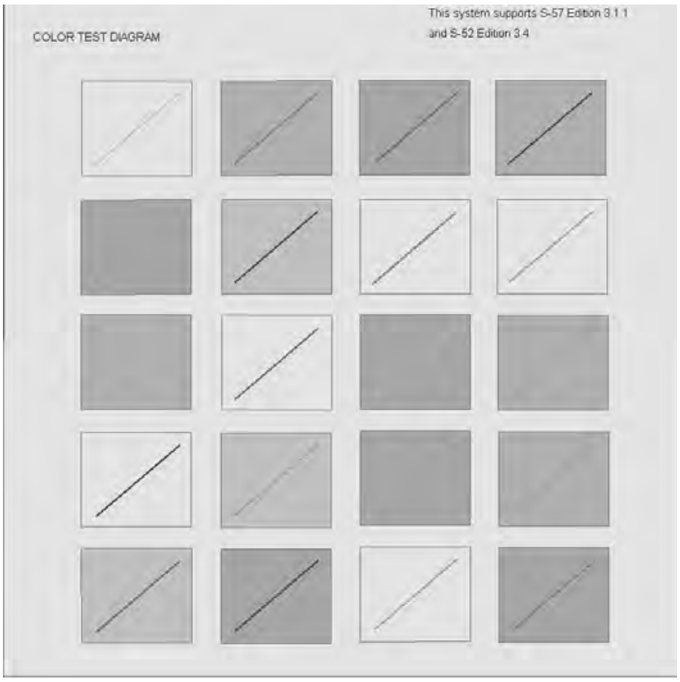
*Aids and Services*



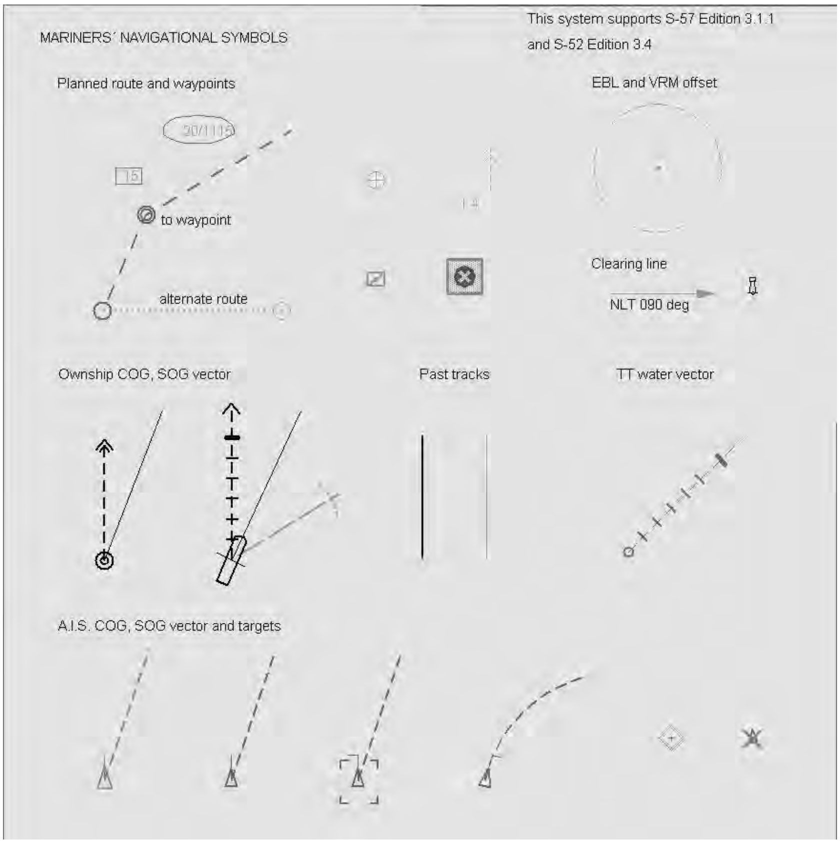
*Buoys and Beacons*




*Topmarks*




*Color test diagram*

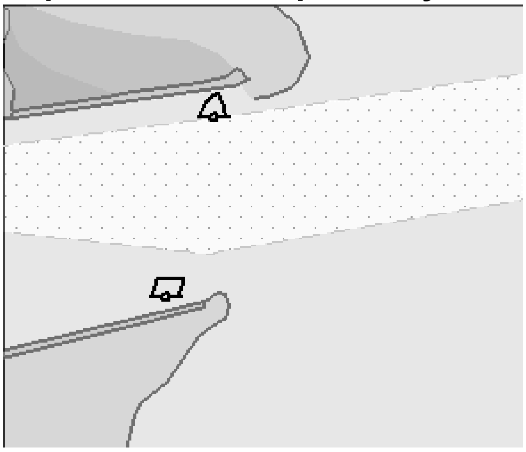


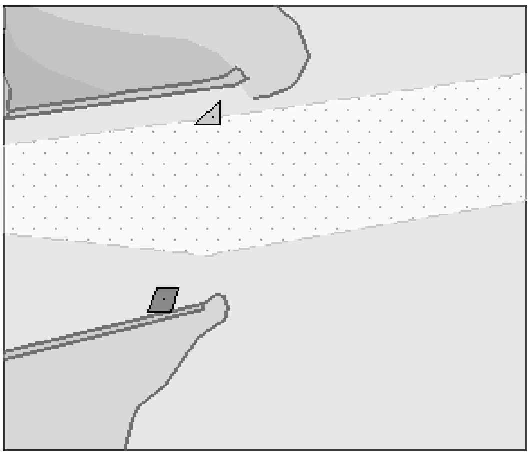

*Mariners' navigational symbols*

# Appendix 3: Interpreting S57 Charts

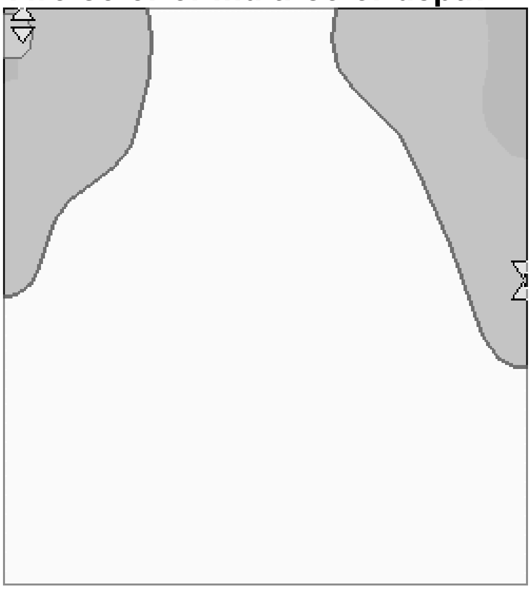
The following examples give you a short introduction to the features of S57 charts.

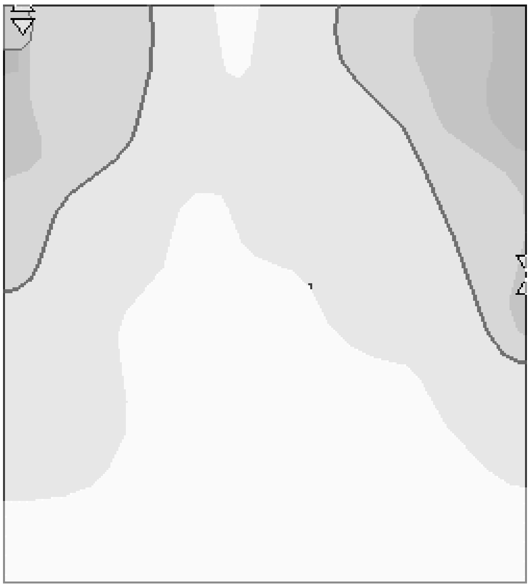
## Paper chart or simplified symbols



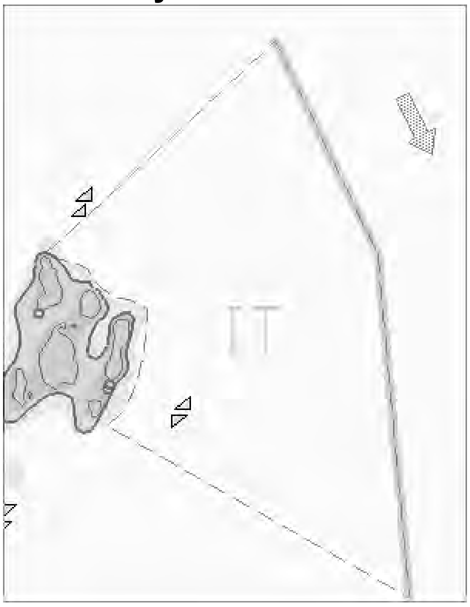


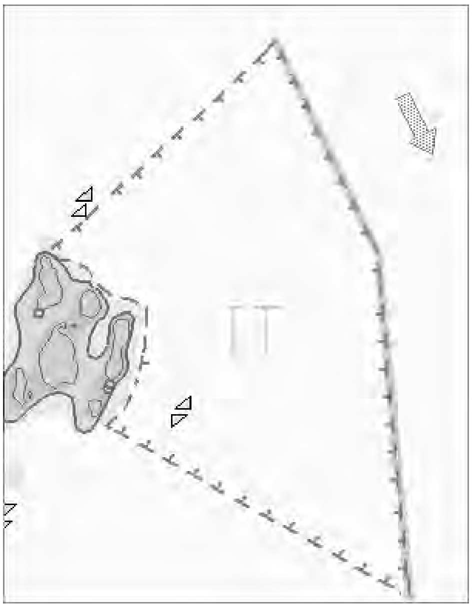
## Two color or multi-color depth



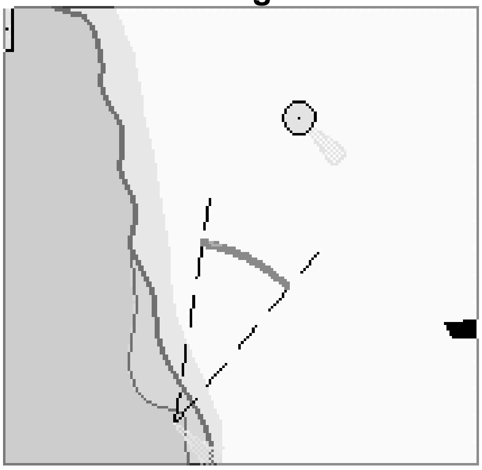


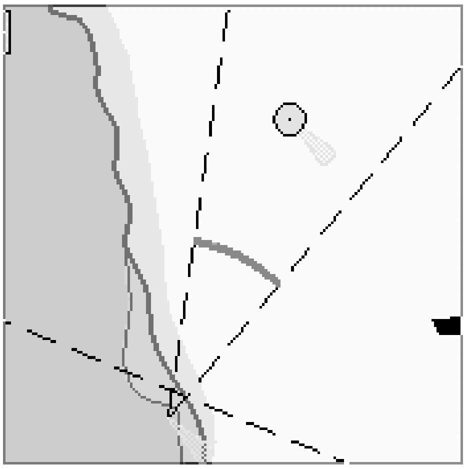
## Plain or symbolized boundaries



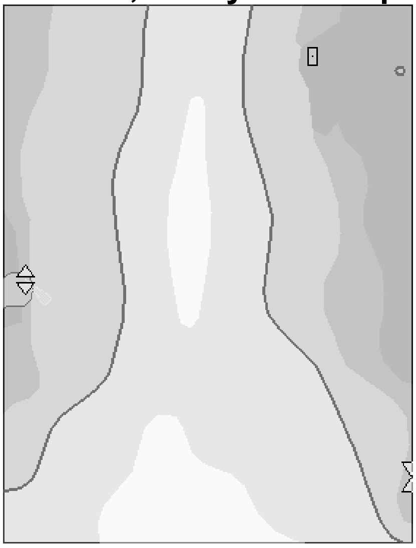


## Limited or full light sectors

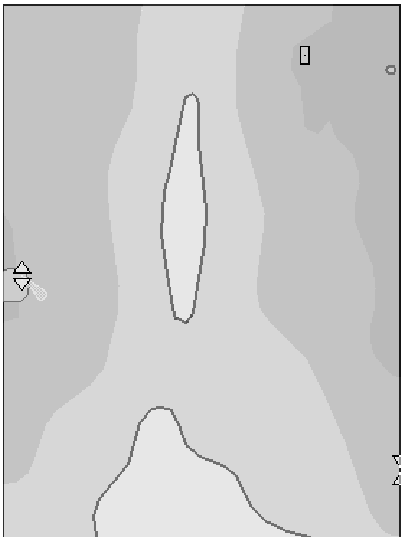




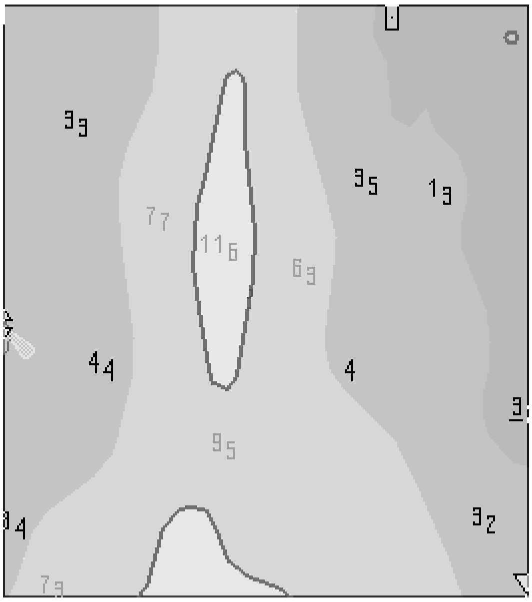
## Shallow, safety and deep contours



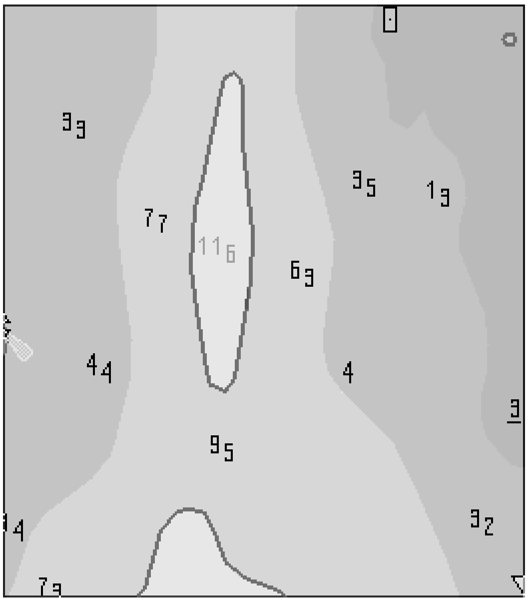
*Shallow = 2m, Safety = 5m and Deep = 10m*



*Shallow = 5m, Safety = 10m and Deep = 20m*

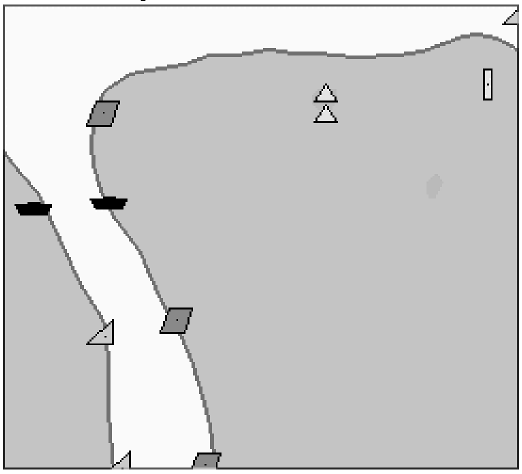


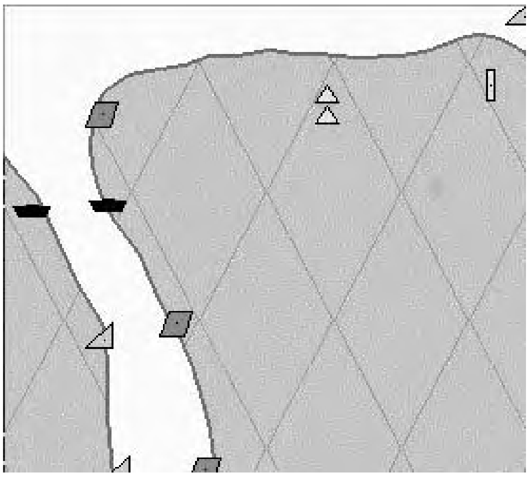
*Safety depth = 6m*



*Safety depth = 10m*

## Shallow pattern





## Items on Standard page of Chart Display dialog box

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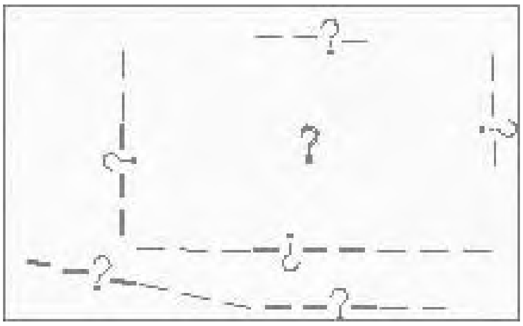
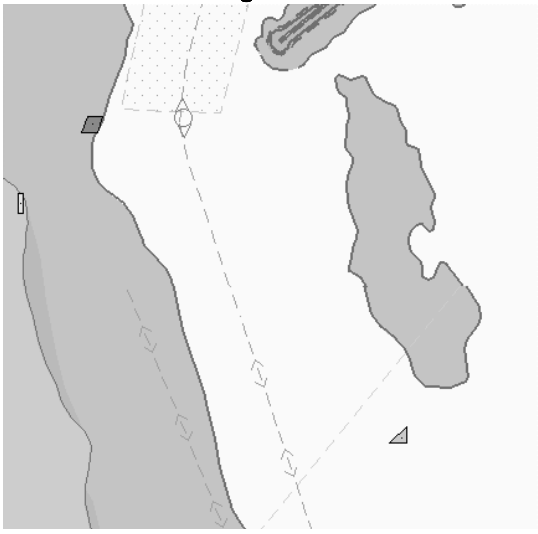
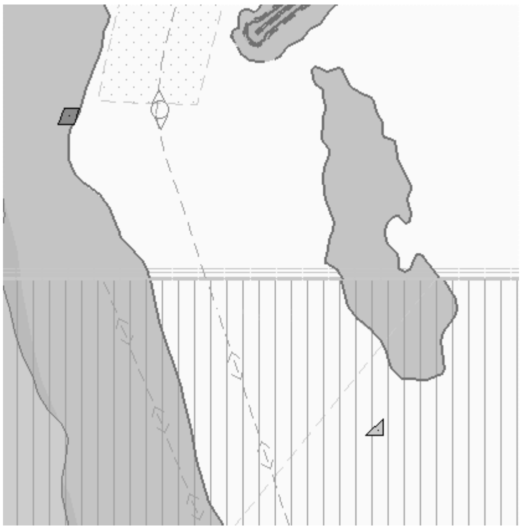
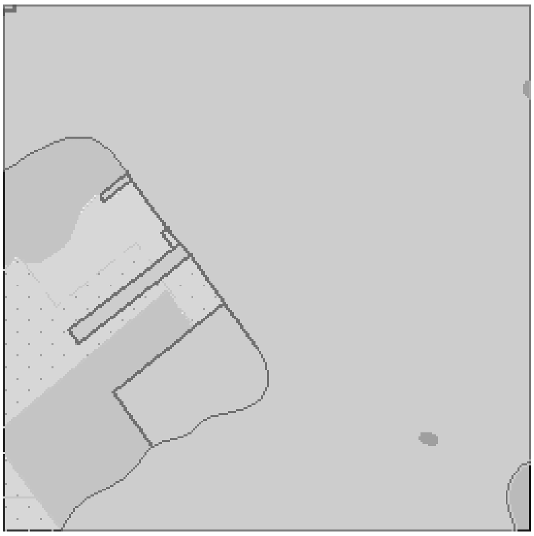


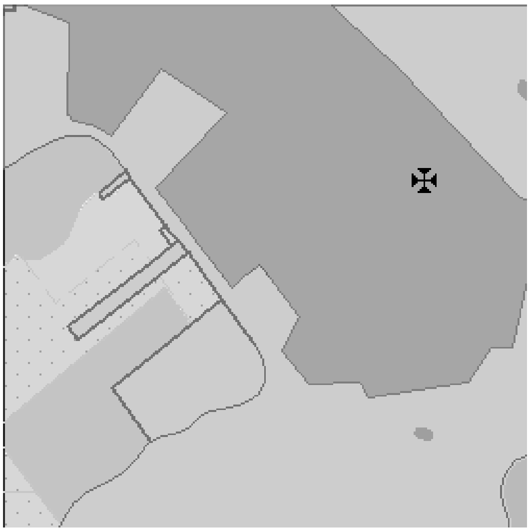
### *Chart data coverage*



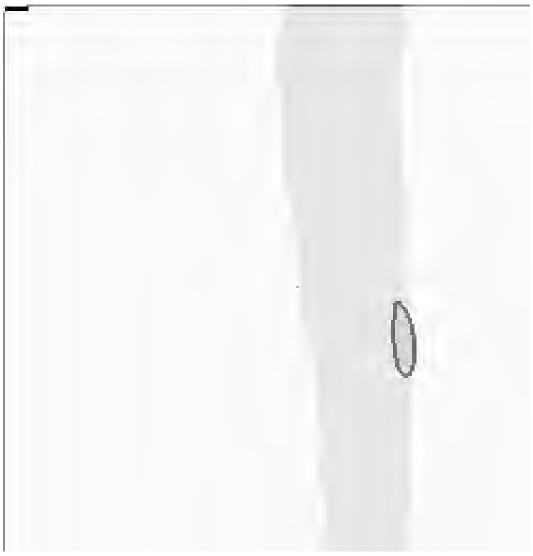


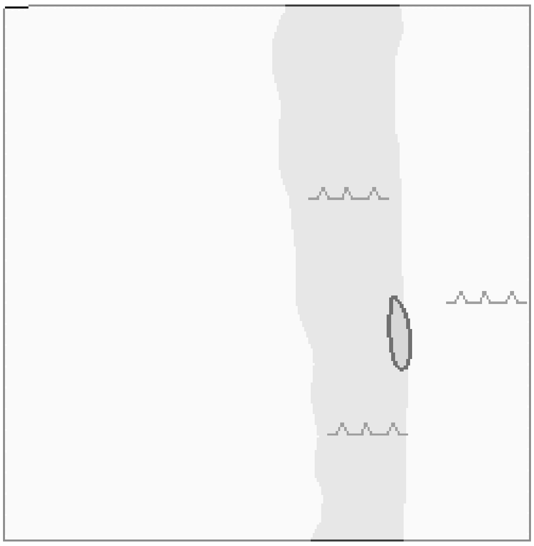
***Land features***



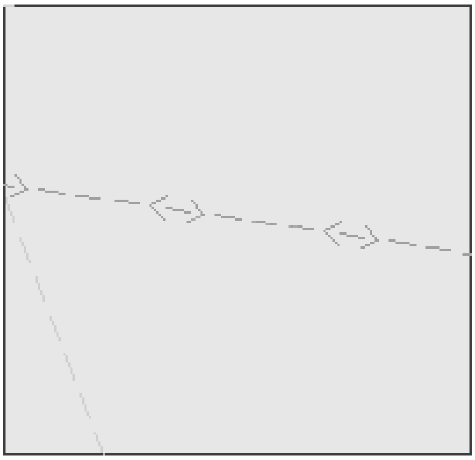


***Water and seabed features***

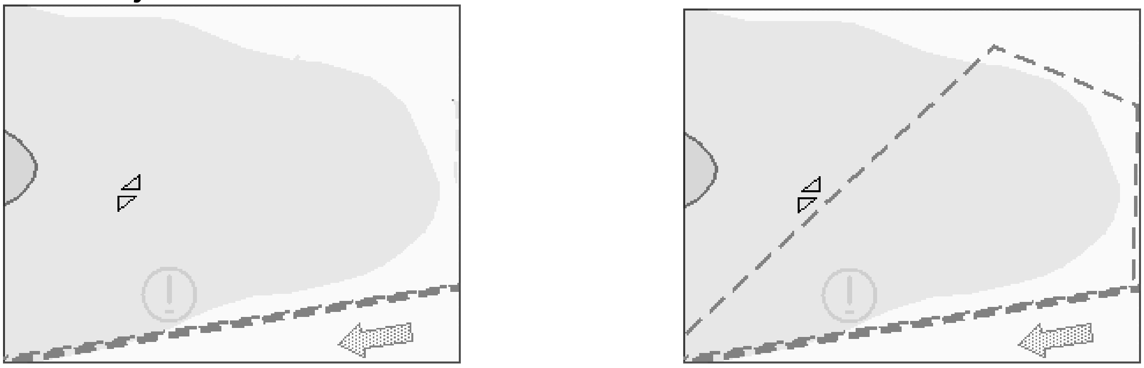




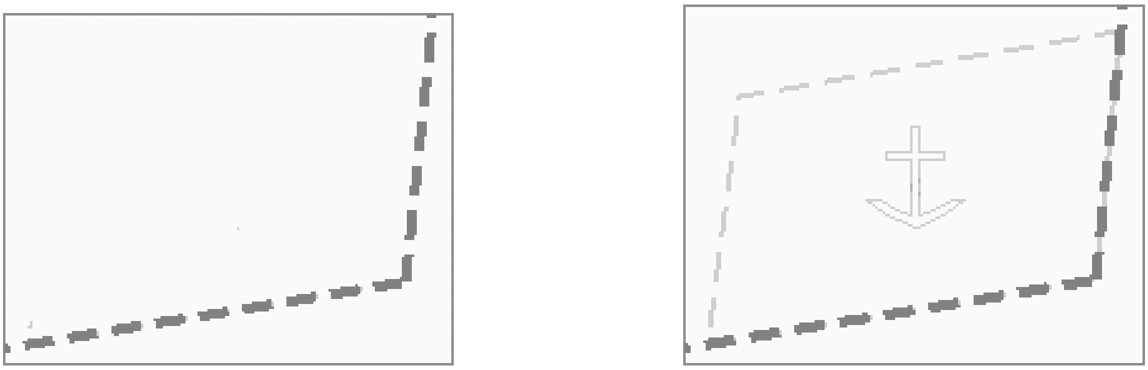
***Traffic routes***



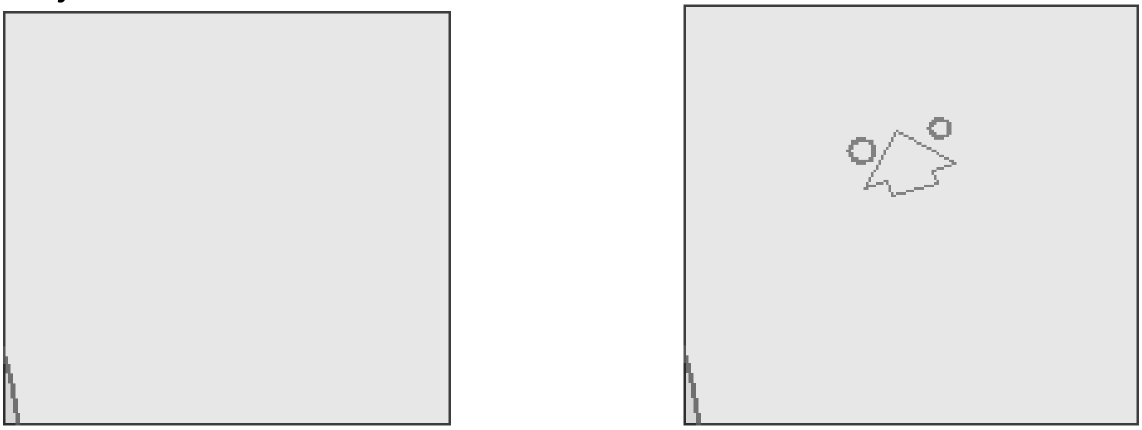
***Cautionary areas***



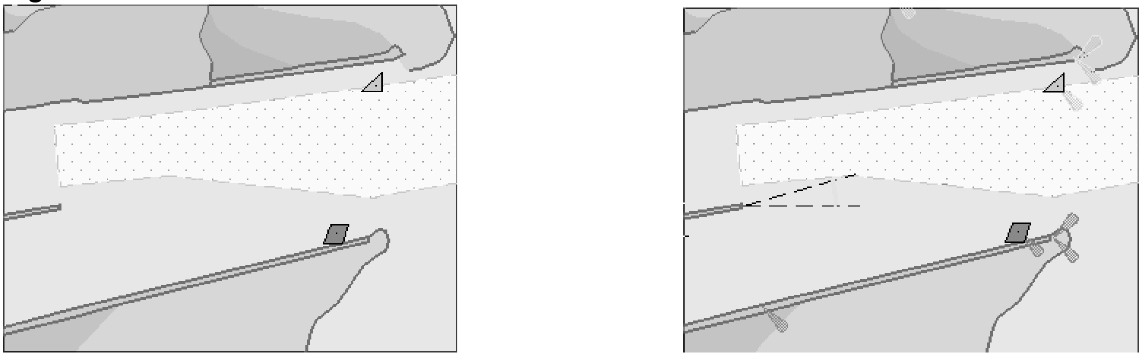
***Information areas***



***Buoys and beacons***

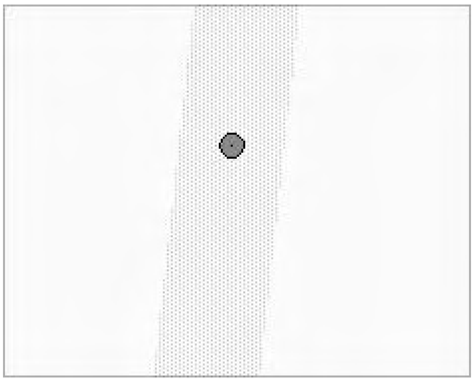


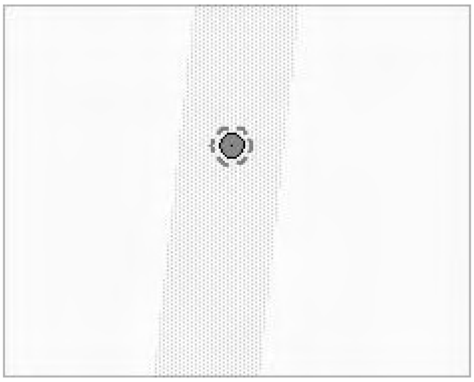
***Lights***



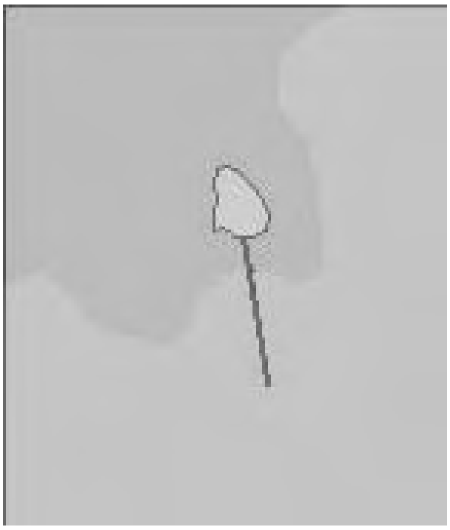
***Fog signals***

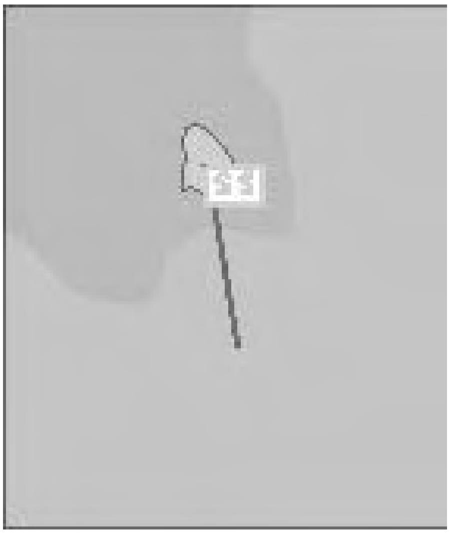
***Radars***





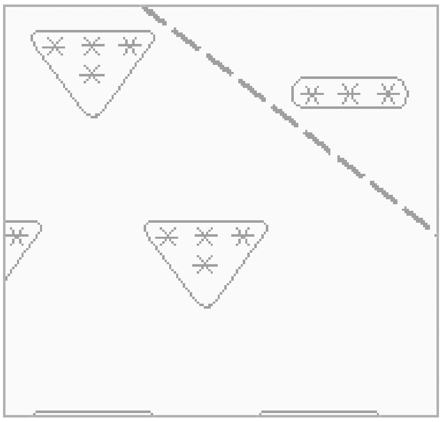
***Services***



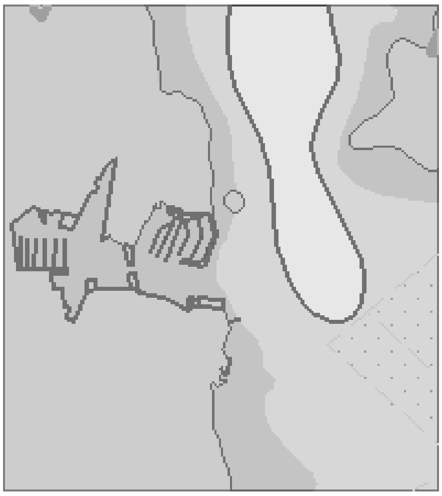


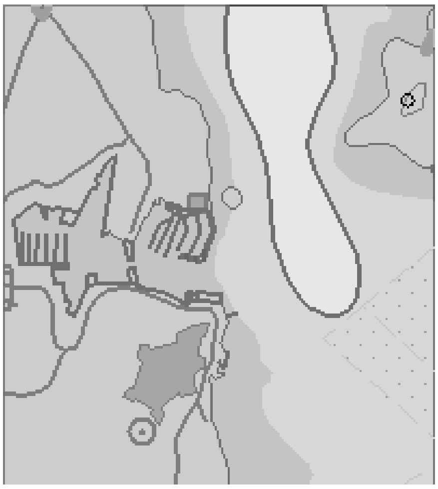
## Items on Other page in Chart Display dialog box

***Information about chart data***

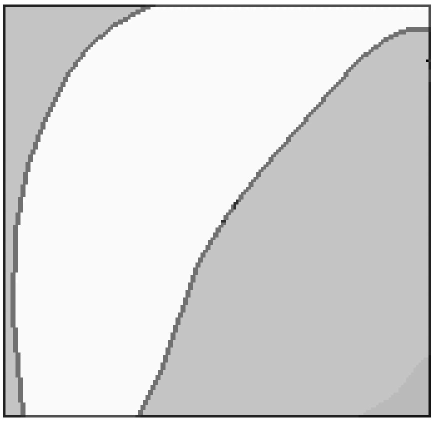


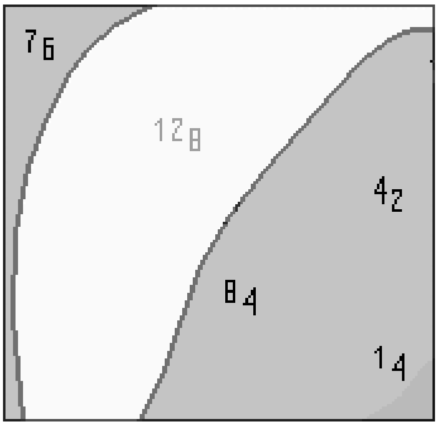
***Land features***



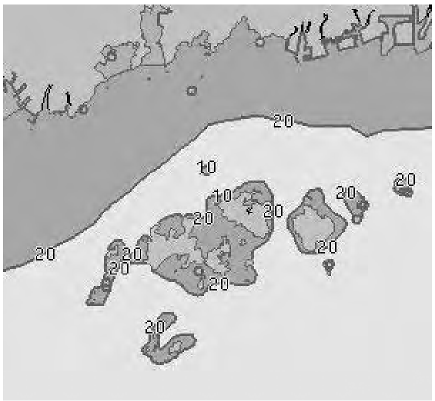


***Soundings***

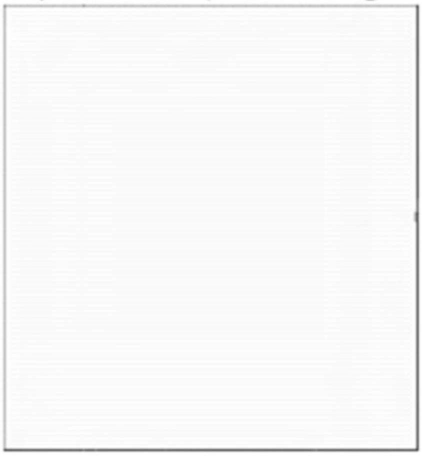




***Depth contour labels***



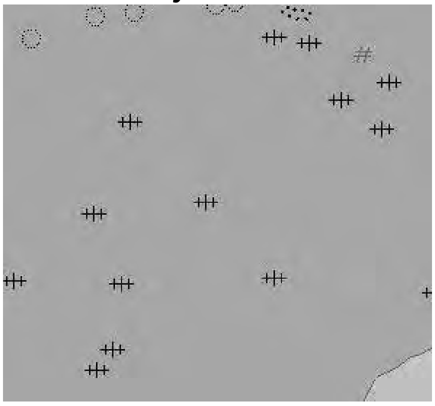

***Depth contours, magnetics, currents***

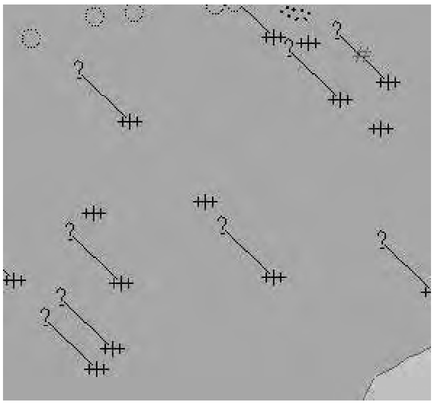


***Seabed, pipelines, obstructions***

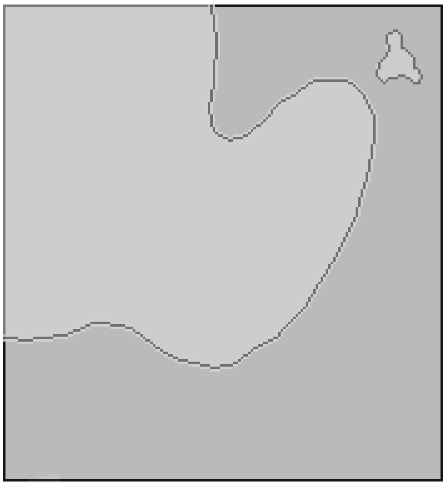
***Obstructions with soundings***

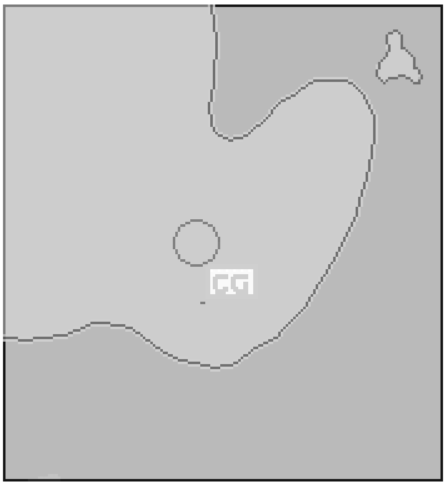
***Low accuracy***



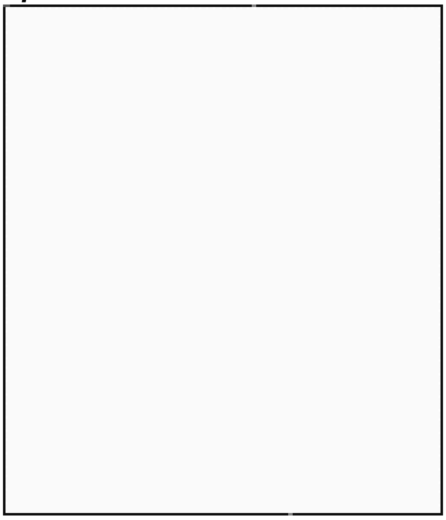


***Services and small craft facilities***

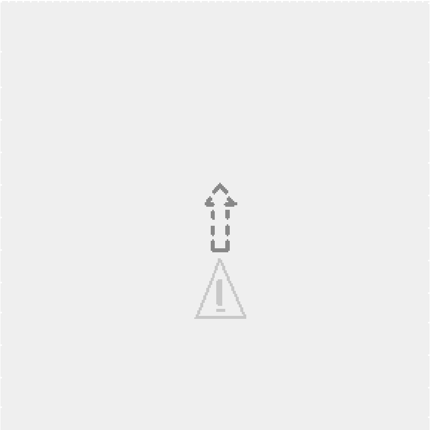


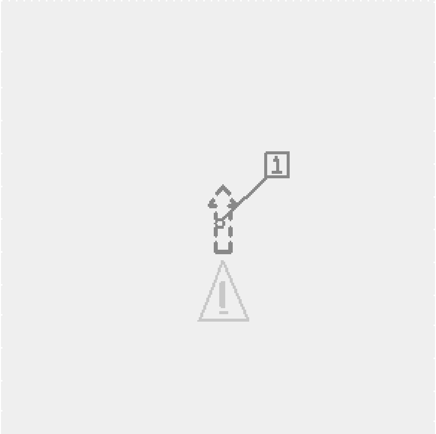


***Special areas***

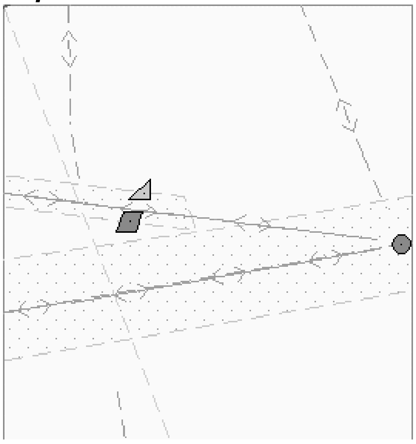


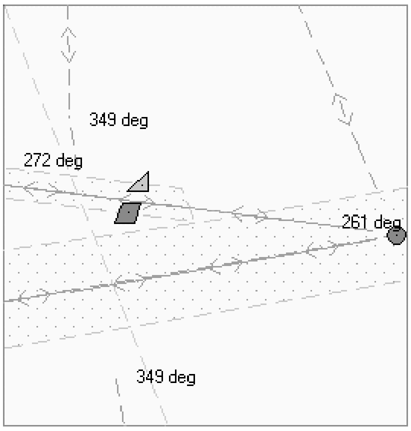
***Additional information available***





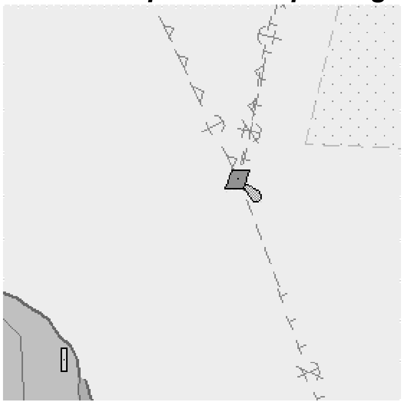

***Important text***

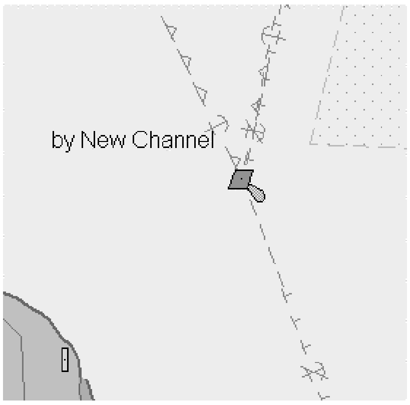




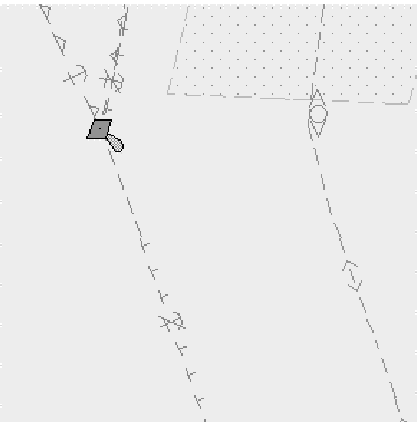

## Text on Other page in Chart Display dialog box

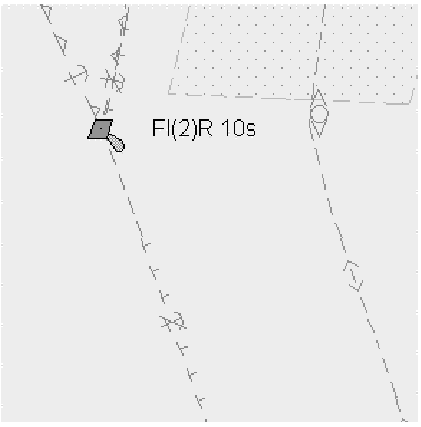
***Names for position reporting***





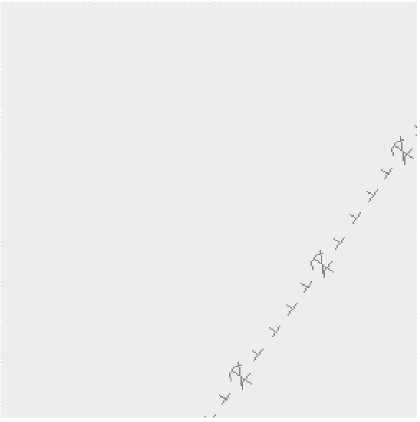
***Light descriptions***

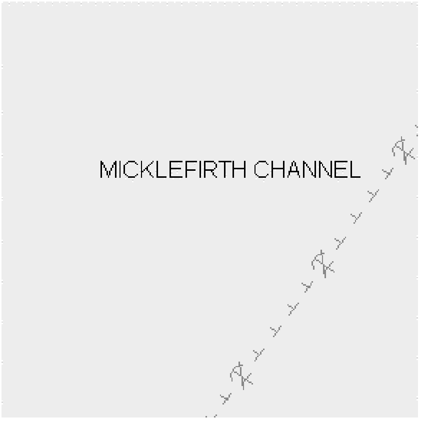




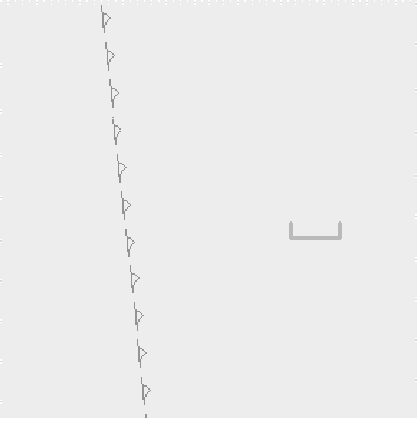

***Nature of seabed***

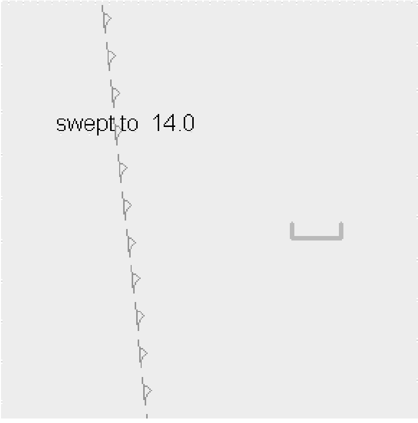
***Geographic names, etc.***



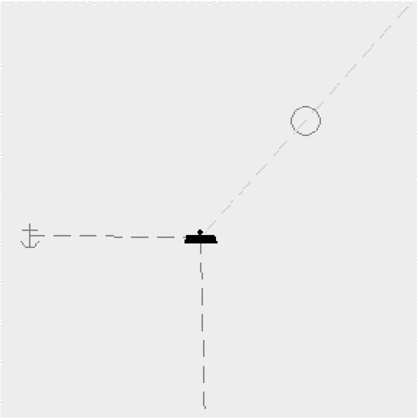


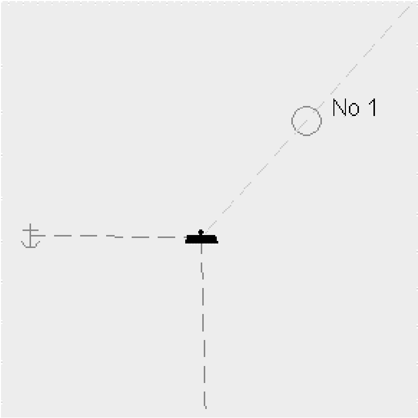
***Swept depths, magnetics***



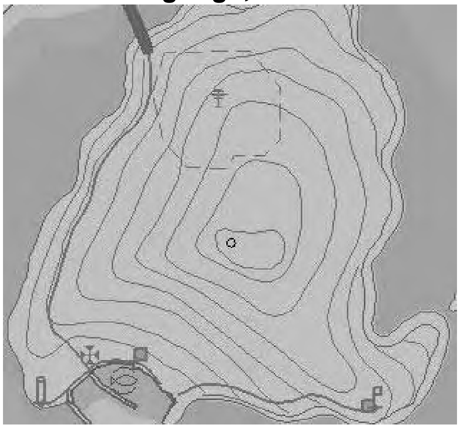


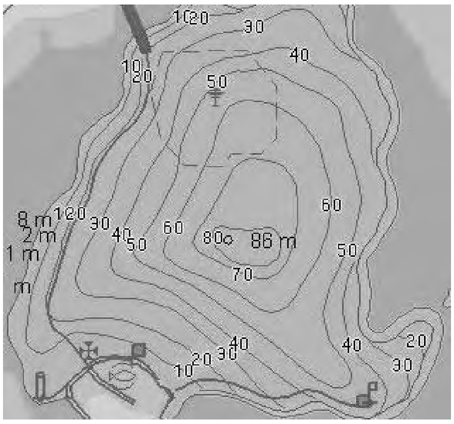

***Berth and anchorage numbers***






***National language, land elevation***





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# Appendix 4: C-MAP CM-93/3 Charts

## A4.1 C-MAP Cartographic Service

Your ECDIS system has the capability of using and displaying the latest CMAP CM-93/3 worldwide vector chart database. These charts are fully compliant with the latest IHO S-57 3.1 specifications.

In order to prepare the system for use with the C-MAP CM-93/3 database, there are a number of things that must be done.

### A4.1.1 How to register the system at C-MAP Norway

Your system that has the capability to use the CM-93/3 database. To do so an Aladdin eToken (supplied by C-MAP) must be connected to the system (if the system has and supports USB). The eToken provides the system with a unique System ID that enables C-MAP to issue correct licenses. The actual System ID can be found on the eToken itself, on the back of the installation CD box or on a sticker placed on the equipment. This ID must be provided on all chart orders, either by email (license@C-MAP.no) or by fax +4751 464701

### A4.1.2 How to order charts

A chart order may be sent together with system registration as described above. It is essential that the required information be sent to C-MAP when ordering charts for a system. C-MAP issues order forms specifying the information that is required, and contains vital information that will allows C-MAP to monitor and maintain your licenses throughout the lifetime of the system. Charts can be ordered by Zone, Area or Cell and these can be seen on our Internet pages at www.C-MAP.no or by downloading the Chart Product Catalogue also available on the web site. Price quotations can be obtained via your chart dealer or direct from your local C-MAP office. Once the license order has been prepared it should be emailed to license@C-MAP.no or faxed to C-MAP Norway AS (+47 51 464701).

### A4.1.3 How to apply for licenses

Once the order has been received at C-MAP, a license will be generated and transmitted back to the operator. This may be in the form of a single alphanumerical string (16 characters), or in the form of a file called PASSWORD.USR. Once this license has been received it should be input using the License Administrator software designed and supplied by the ECDIS/ECS manufacturer. There are two types of licenses, purchase and subscription. Purchase licenses are valid indefinitely while subscription licenses need to be renewed every 12 months from the start of the subscription. Failure to renew a subscription will result in the charts becoming unavailable.

### A4.1.4 Troubleshooting

If you are having problems installing your software or charts please check the following before contacting C-MAP:

- That you have registered the WORLD database in the GDBADMIN application.
- That the registered WORLD database is available.
- That you have correctly typed the license string.

**Contact Information:** For information or help please call you're nearest C-MAP Office (details can be found on the reverse side of the C-MAP chart CO box) or contact C-MAP Norway:

C-MAP Norway AS Post Box 212 Hovlandsveien 5 379 Egersund Norway

Tel. +4751464700 Fax.+4751464701

Email: technical@C-MAP.no

# A4.2 Chart Subscription Service

## A4.2.1 C-MAP service

There are three different services available through C-MAP Cartographic service that can be used in FURUNO FCR-2x07. Two of them are using CM-93/3 format. These data sets contain two databases:

CM-ENC (SENC delivery), Official Electronic Navigational Charts distributed by C-MAP on DVD.

Global Chart Database, which is available on CM93/3 professional CD-ROM. This database contains chart data original produced both by C-Map and Hydrographic Office.

Global Chart Database, which is available on CM93/3 professional+ DVD. This database contains chart data original produced both by C-Map and Hydrographic Office.

**Note**: CM-ENC is not yet available. If you change CD ROM service to DVD service, you need to also have a new license for the DVD service. Contact your chart agent or C-MAP for details.

Additionally, the previous CM-93/2 Global Chart Database is compatible for use with the FCR-2x07.

## A4.2.2 What is SENC delivery?

ENCs can be distributed as ENC delivery or SENC delivery. Both deliveries can be used in FCR-2x07.

In ENC delivery charts are distributed directly from source like PRIMAR, IC-ENC, JHA etc. They are delivered onboard in ENC format (using S-57 and S-63) then charts are loaded into ECDIS. For more information, see section 7.5.S57 Chart Service from an RENC.

In SENC delivery charts are converted from ENC to SENC before delivery to onboard and loading to ECDIS. A CM-ENC delivery is SENC delivery.

**Important notice!**

If you are using both services (ENC and SENC deliveries) having the same chart name loaded into ECDIS through both deliveries, priority of displaying the chart is in ENC delivery.

Chart Updates for ENC delivery are only for charts of ENC delivery and chart updates for SENC delivery is only for charts of SENC delivery. You have to keep charts up-to-date separately.

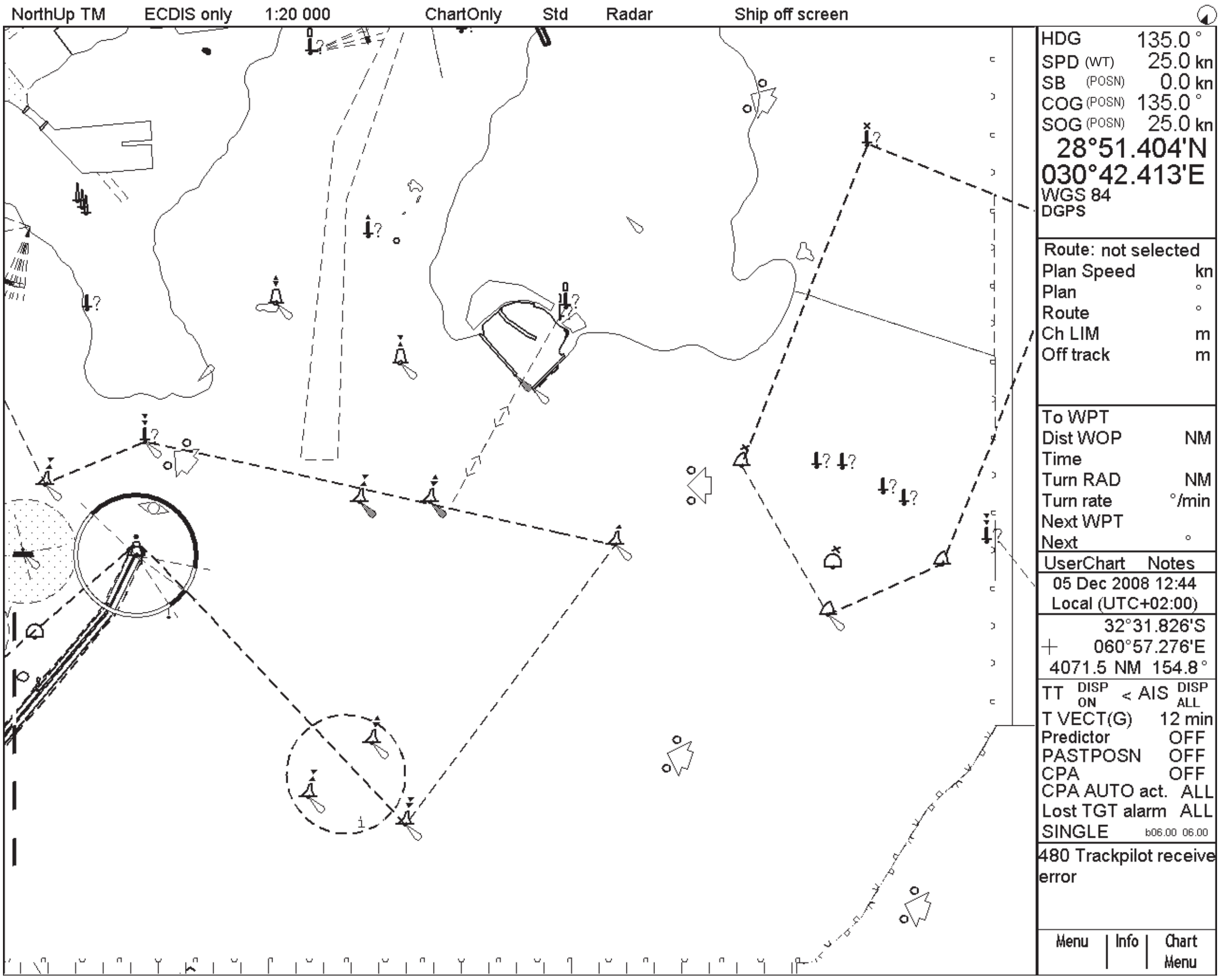
If you change from ENC delivery to SENC delivery, remove old charts from ECDIS before loading charts from new delivery.

When using any C-MAP chart, the indication "Non ENC Data" appears at the upper right corner on the ECDIS display.

### A4.2.3 CM-ENC service (SENC delivery)

Chart data distributed through the service is S57 ed.3.0 or ed. 3.1 coded ENC in CM-ENC format.

When using charts loaded and updated using CM-ENC service, on ECDIS there are not any indications on upper right corner.

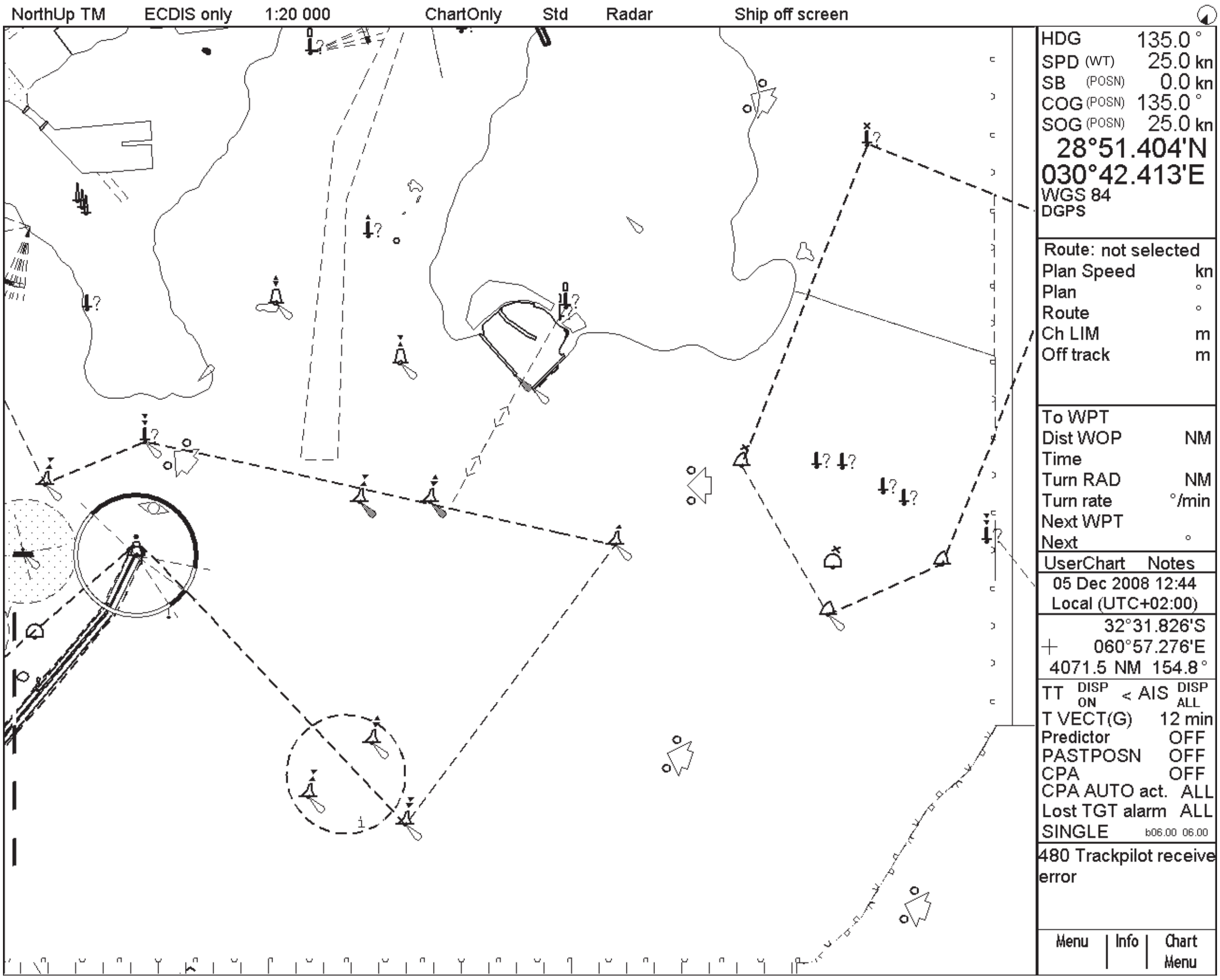


## A4.2.4 RENC service

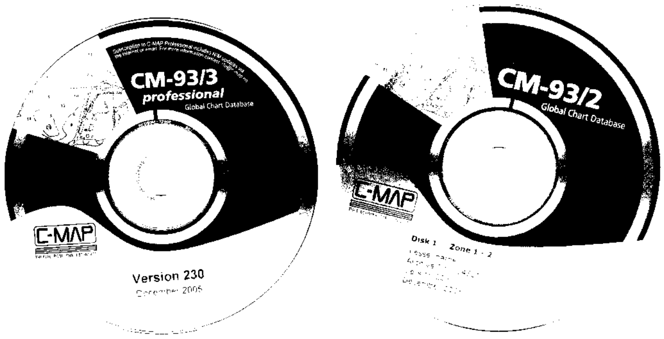
RENC service produced by Primer or IC-ENC is considered to legally fulfil SOLAS requirements as primary aid of navigation. National Hydrographic Organization (NHO) may have arranged similar subscription service as RENC on its own waters.

Chart data distributed through the service is S57 ed.3.0 or ed. 3.1-coded ENC.

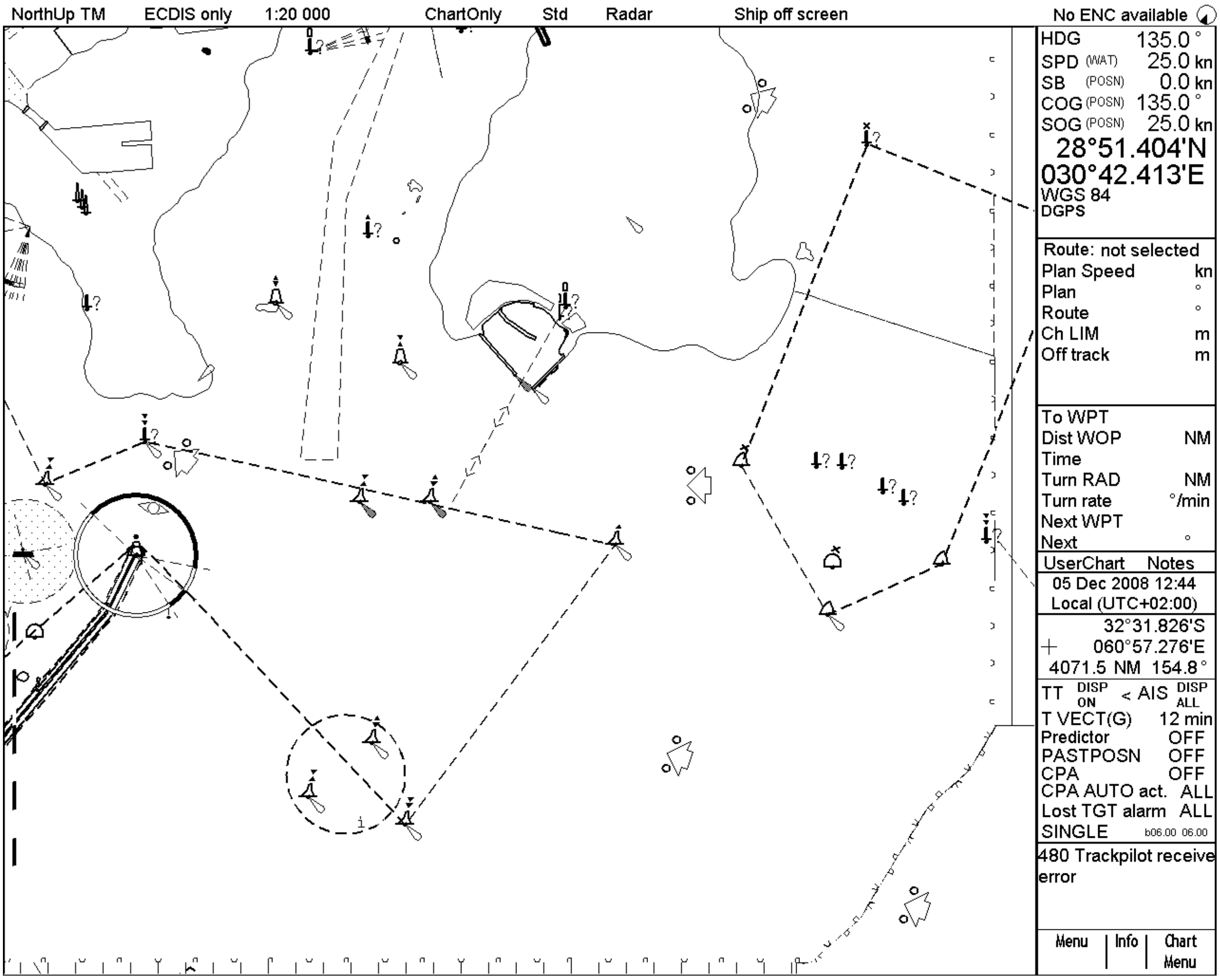
When using charts loaded and updated using RENC or NHO service, on ECDIS there are not any indications on upper right corner.



## A4.2.5 CM-93/3 Prof, CM-93/3 Prof+ and CM-93/2 services




When using any of mentioned above you will always have indication "No ENC Available" on upper right corner of ECDIS. If there is indication "No ENC Available" you have to refer paper charts in navigation.



# A4.3 CM93/3 Chart Display

## A4.3.1 Introduction

CM93/3 charts are vector charts displayed together with ENC (S57) and CM93/2 charts. These charts have the priority order shown below.

CM- ENC

CM93/3 Prof and CM93/3 Prof

CM93/2

If there is available the same navigational purpose charts over the area, priority is as shown above.  Areas where ENC is not available CM-ENC are shown, CM93/3 Prof or CM93 Prof+ and CM93/2 are available, CM 93/3 is displayed. Areas where ENC and CM93/3 Prof or CM93/3 Prof+ are not available CM93/2 is displayed.

The chart legend, which provides various data about the chart currently displayed, can be toggled on and off by placing the cursor in the sidebar, clicking the right mouse button, choosing Chart Legend from the menu then pushing the scrollwheel.

This system is capable of showing more than one S57 chart at a time. This feature is called the multi-chart display. If one S57 chart does not cover the whole display, the system will open more S57 chart cells for display, if appropriate cells for the displayed area are available. The chart legend shows information about S57 charts displayed on the electronic chart display area. The information is displayed with reference to your ship's position if automatic TM reset is active, or with reference to the current position of the cursor if automatic TM Reset is OFF.

| | |
|---|---|
| Cell name | Z12AS430 |
| Navigational purpose | Coastal |
| Issue date | 20030206 |
| Edition number | 3 |
| Last displayed update | 64 |
| Update issue date | 20030206 |
| Last update appl. date | 20051116 |
| Projection | Mercator |
| Horizontal datum | WGS 84 |
| Vertical datum | Mean sea level |
| Sounding datum | Mean sea level |
| Quality of data | Zone of confidence U |
| Magnetic var. | |
| Depth | metres |
| Height | metres |

**Cell name:** Name of chart.

**Navigational purpose:** S57 charts are compiled for a variety of navigational purposes. The navigational purpose, for which an individual S57 chart has been compiled by a Hydrographic Office, is indicated in this field. Alternatives are Overview, General, Coastal, Approach, Harbour and Berthing.

**Issue date:** Issue date of the Base cell of the chart.

**Edition number:** Edition number of the chart.

**Last displayed update:** Number of last update, which is visible on the chart screen.

**Update issue date:** Date to which the last update, which is visible on the chart screen, is effective.

**Last update appl. date:** Issue date of last update, which is visible on the chart screen.

**Projection:** Projection of the chart. The projection is always Mercator.

**Horizontal datum:** Horizontal datum of the chart data as published by the chart producer. By definition this must be WGS 84.

**Vertical datum:** Vertical datum of the chart.

**Sounding datum:** Datum used for soundings.

**Quality of data:** Quantitative estimate of the accuracy of chart features, given by the chart producer.

**Magnetic var.:** Amount of magnetic variation. A positive value indicates a change in an easterly direction and a negative value indicates a change in a westerly direction.

**Depth:** Unit of measurement for depth.

**Height:** Unit of measurement for height above sea level (for example, clearance height).

## A4.3.2 How to select CM93/3 chart material to use

To activate S57 chart material onto the display, do the following:

Put the cursor just above the chart scale indication in the information area.

Activate S57 Chart appears in the mouse functions area; push the left mouse button.

## A4.3.3 How to select charts for viewing

### *How to select a chart from a catalogue*

To choose a chart for viewing from a catalogue, do the following:

Choose Chart Catalogue from the Chart menu.

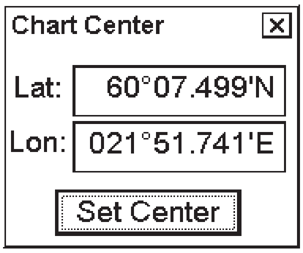
From the Chart Catalogue dialog box, use the cursor to choose desired chart.

Click the **Open** button.

### *How to browse your charts*

You may view S57 charts using different positions and different scales. The basic tools for browsing charts are **Range -, Range+, Set Chart Center, ShipOffcenter** and **TM/CU Reset**.

**Set Chart Center** allows you to look ahead from a place other than your ship's current position. Spin the scrollwheel to display Set Chart Center/Info/Activate Scroll in the mouse functions area and then push the left mouse button. The dialog box shown below appears. Turn off automatic true motion reset by displaying and clicking TM/CU Reset (in the mouse functions area). When true motion reset is off, the indication "Ship out of dsp" appears in the information area. Use the scrollwheel to set the latitude and longitude position for chart center then click the **Set Center** button.




To restore own ship's position to the screen center, display TM/CU Reset/Info/ShipOffcenter in the mouse functions area and then push the left mouse button.

**Range -** and **Range+** change the chart scale. If true motion reset is active, ZOOM IN and ZOOM OUT keep the relative position of your ship with respect to the display. If true motion reset is on, ZOOM IN and ZOOM OUT keep the relative position pointed by the cursor with respect to the display.

The system automatically chooses next larger or smaller scale. If a chart with larger compilation scale is available at your current viewing position, the message "Larger Scale Data Exists" appears.

### *How to look for charts around your ship*

You can use either true motion or relative motion. In the true motion mode, your ship moves until it reaches the true motion reset borderline, where it jumps back to an opposite position on the screen based on ship's course. In the relative motion mode, your ship stays in a fixed position, while the chart moves on screen.

If, in the true motion mode, you reset own position with TM/CU Reset, your ship will immediately jump to the true motion reset position.

If, in the true motion mode, you use ShipOffcenter, your ship will go to that position on screen and continue true motion movement from that position. When it reaches the true motion reset borderline, it will automatically jump to the true motion reset position.

If, in the relative motion mode, you reset own position with TM/CU Reset, your ship will immediately jump to the true motion reset position and use that position as fixed position to stay on screen.

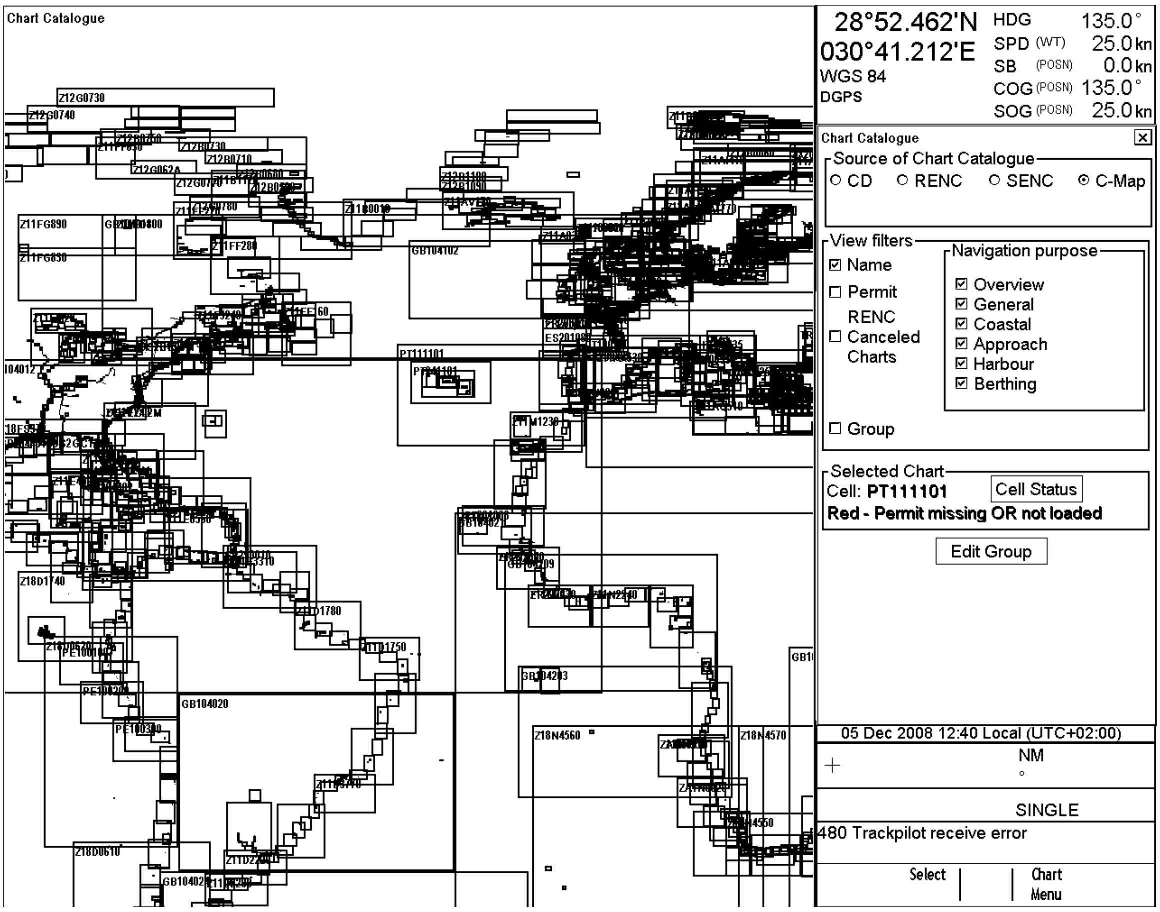
If you use relative motion, you can choose a new fixed position for your ship by using ShipOffcenter.

Use Range - and Range+ to choose desired chart scale.

### A4.3.4 Chart catalogue of C-MAP charts

You can use the chart catalogue to graphically view content of loaded C-MAP database(s) into ECDIS.

1. Open the Chart menu and select Catalogue.
2. Select "Source of Chart Catalogue" as C-MAP. Use Navigation purpose selection to view desired charts.




Charts for which you possess a valid license are marked in green. Charts for which you have no license or the license has expired are shown as red borderlines.

**1. Source of Chart Catalogue**

**CD ROM:** Display charts available in a named "CD ROM".

**RENC:** Display charts available from an RENC.

**SENC:** Display charts stored in your hard disk in SENC format.

**C-MAP**: Display charts of CM93 ed. 3 chart database stored on ECDIS.

**2. View Filters**

**Name:** Display also cell names in graphical coverage display.

**Permit:** Display only charts for which you have permit.

**RENC Cancelled Charts:** Display charts that are cancelled in an RENC.

**Group**: Display charts that are member of selected group.

**Navigation purpose:** Display charts for chosen navigation purpose (overview, general, coastal, approach, harbour, berthing).

**3. Selected Chart**

**Cell:** Name of the chart

**Open:** Opens selected chart to ECDIS display.

The **chart limit boxes** are color-coded as follows:

**Green** You can view chart on ECDIS.

**Red** You cannot view chart on ECDIS, because license is missing or license has expired for the chart.

# A4.4 S57 Managing C-MAP charts

## A4.4.1 Licensing system used by C-MAP

The licensing system used with CM-93/3 professional charts is based on the serial number of eToken.

The eToken is connected to USB port on the ECDIS and it identifies ECDIS for CM-93/3 professional charts. It must be connected to ECDIS always when using CM-93/3 professional charts.

The following information is needed to apply for subscription of CM-93/3 professional charts:

- Company Name:
- User Name:
- Dongle ID (available on tag of eToken):
- Reason for License (sale, development, demo)
- Coverage required (World, Zone x, Area x, cell x)
- Duration of license (3 month or 1 year)
- Database version (available on CD ROM label):

Based on this information, C-MAP is able to process a code that is delivered onboard as a text string or a file called "password.usr".

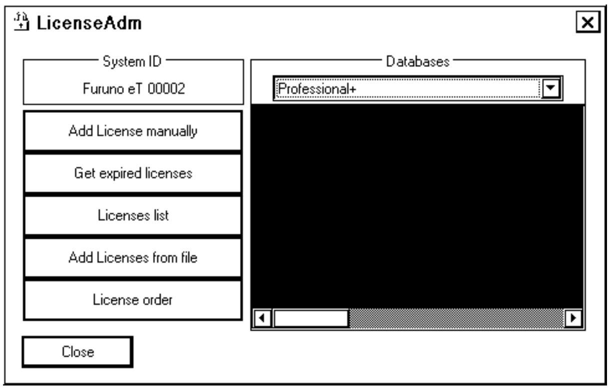
## A4.4.2 Introduction

Below are the steps necessary for ordering CM-93/3 professional charts.

1) Find eToken ID. See "System ID for C-MAP".
2) Define your subscription and deliver this information to your chart agent together with System ID information.
3) You will receive C-MAP database(s) on CD-ROM or DVD. Load Database(s) into ECDIS. See "Load of CM93/3 database to ECDIS".
4) You will receive License(s) for C-MAP database(s) either in file or character string. See "License of CM93/3".

## A4.4.3 System ID for C-MAP

Each ECDIS has individual eToken connected to USB. Find eToken ID in the following sequence:
Menu → Chart Menu → C-MAP Ed3 → Licenses




It is indicated as System ID.

# A4.5 CM93/3 Database

There are three different CM93/3 Databases that can be loaded into ECDIS:

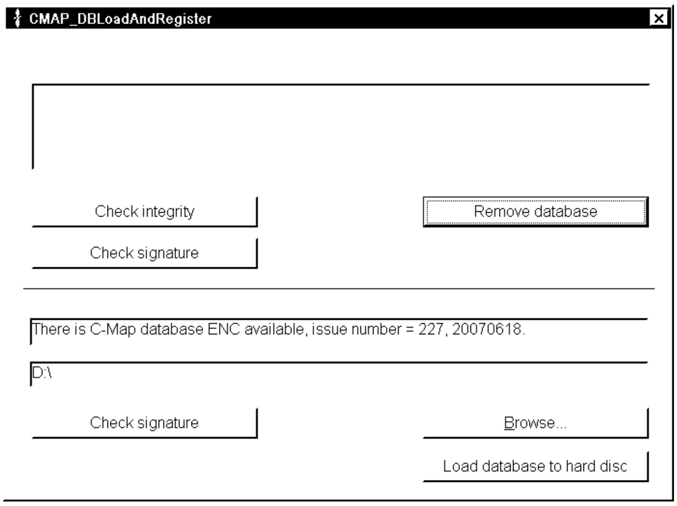
- CM93/3 Professional, available on CD-ROM
- CM93/3 Professional +, available on DVD
- CM-ENC, available on DVD

**Note:** CM-ENC is not yet available.

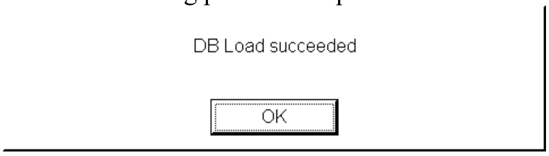
## A4.5.1 Load of CM93/3 database to ECDIS

Charts are available on CM93/3 professional CD ROM. To load them from CD to ECDIS, proceed as follows:

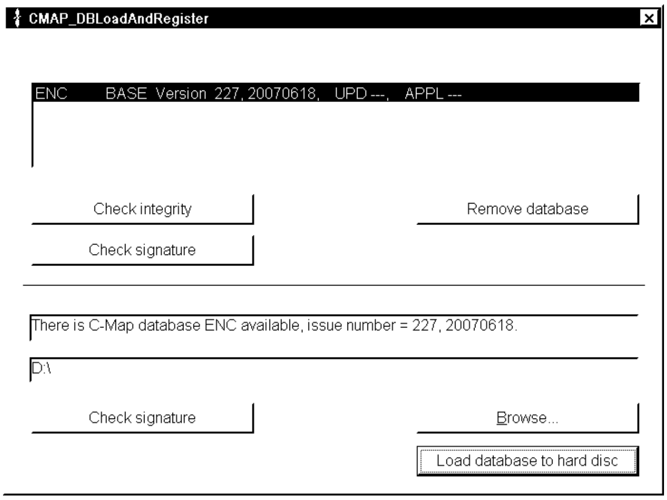
1. Menu -> Chart Menu -> C-Map Ed3 -> Load and register for use. The following dialog box appears; insert CD ROM/DVD.




2. Click **Load database to hard disc** button.
3. Wait until loading process completed.



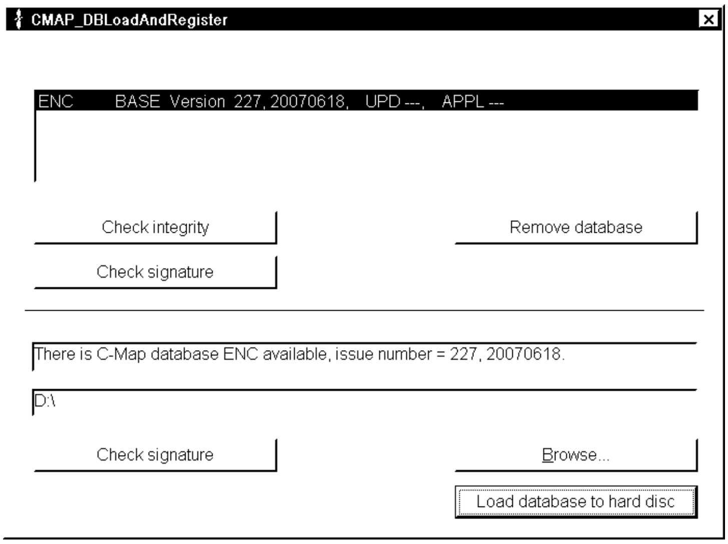

4. You can see loaded database version and issue date.



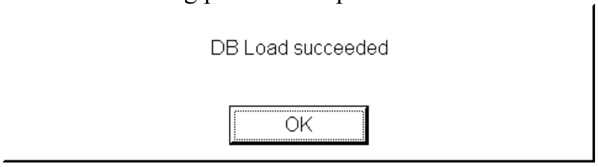
## A4.5.2 Use of multiple databases

It is possible to use CM93/3 Professional, CM93/3 Professional + and CM-ENC databases at the same time at the same workstation.

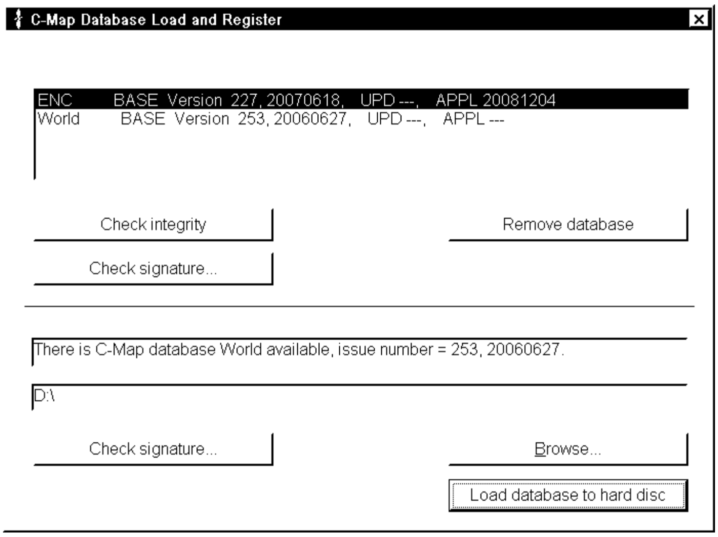
1. Menu -> Chart Menu -> C-Map Ed3 -> Load and register for use. The following dialog box appears;, insert CD ROM/DVD.




2. Click **Load database to hard disk** button.
3. Wait until loading process completed.




4. You can see loaded database version and issue date.




Above is an example where CM-ENC and CM93/3 Professional databases are loaded into ECDIS.

# A4.6 License of CM93/3

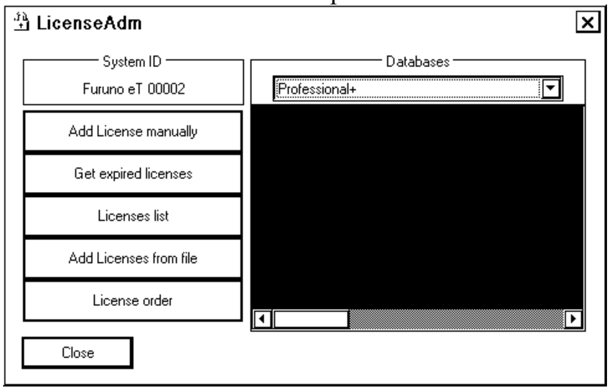
To view charts of C-Map database(s), you need to load license for database. For each database (CM93/3 Professional, CM93/3 Professional + and CM-ENC) C-Map generates own license.

## A4.6.1 How to add license from file

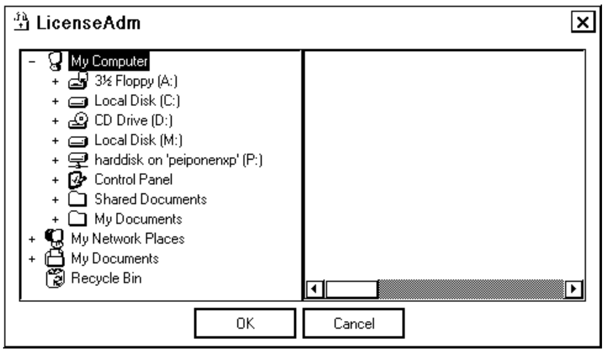
To get access to CM93/3 chart database, you have to enter a code that is received from C-Map directly or through Chart agent. The code defines coverage of charts you can display on ECDIS.

To enter code proceed as follows:

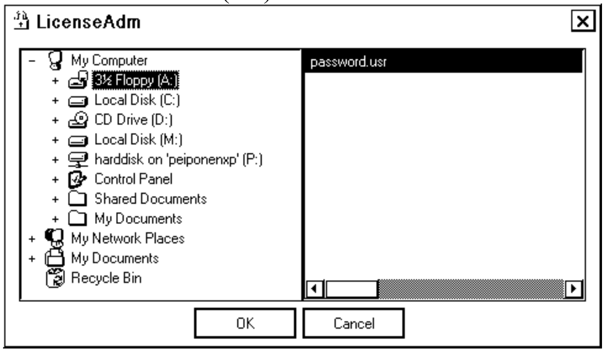
1. Menu -> Chart Menu -> C-Map Ed3 -> Licenses




2. Click Add Licenses from file.

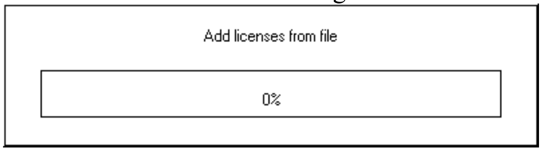



3. Select desired drive (A:\).

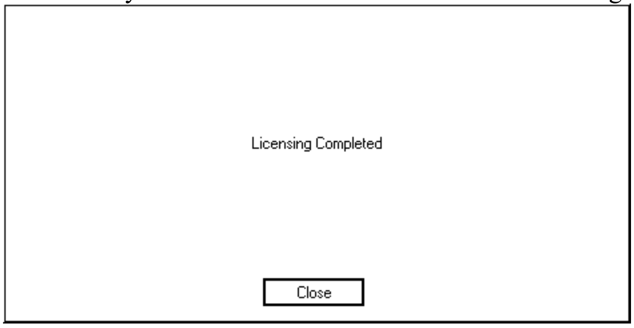


4. Click **OK** button. You have to confirm load of new code

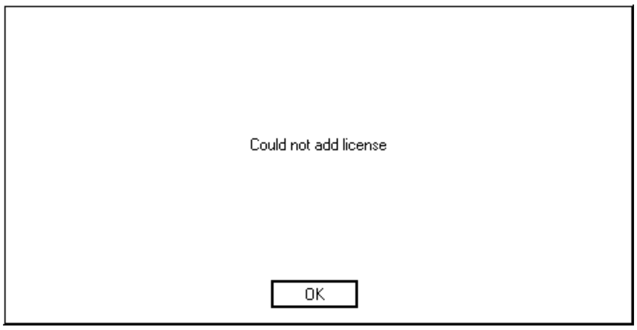
5. Click **YES** button. Now reading code.




6. Successfully loaded code will be indicated with following dialog box.

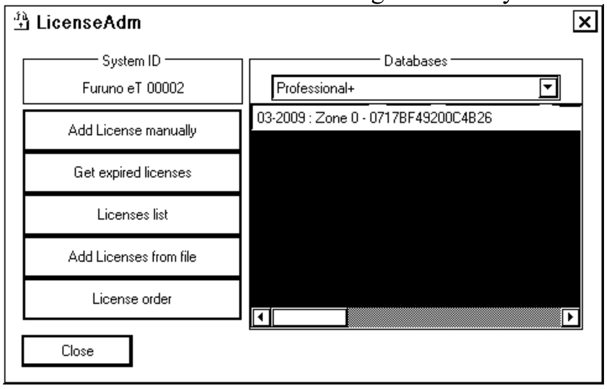



7. Click **Close** button.




If the above dialog box appears it indicates that there is mismatch between chart database and password.usr. Check that you have the password that is delivered to you to be used together with CM-93/3 professional CD-ROM.

8. You can see in License Adm dialog box listed your licenses.



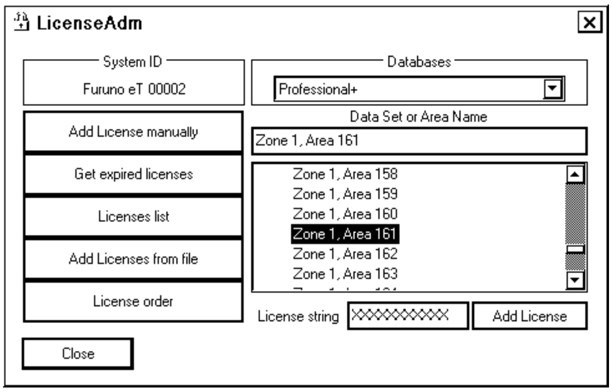

License for Zone 0 has been loaded in this system.

9. Click **Close** button to close dialog box.

## A4.6.2 How to add license manually

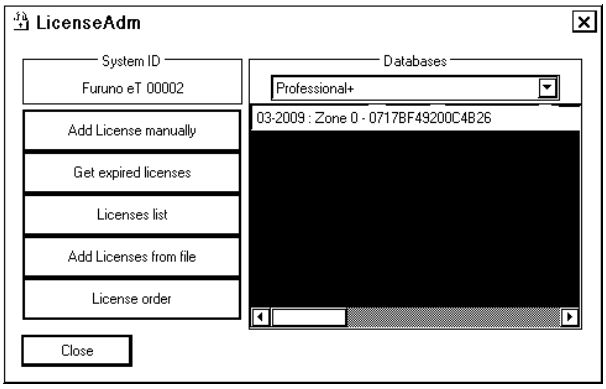
If you receive license as a "License string", you can enter this string manually into ECDIS. To enter code, proceed as follows:

1. Menu -> Chart Menu -> C-MAP Ed3 -> Licenses.




2. Add string received from C-MAP to the "License string" field then click the **Add License** button.

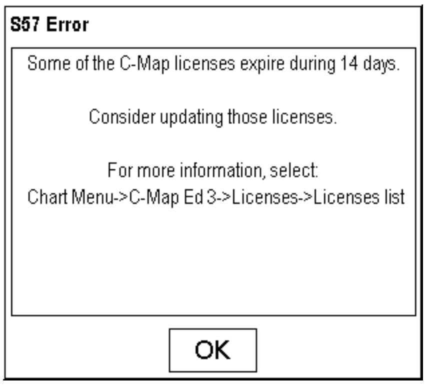
3. Click the **License list** button to see entered licenses.




4. Close the "LicenseAdm" dialog box by clicking the **X** sign in upper right corner.

## A4.6.3 How to renew a license

You will receive a notice 2 months prior to expiration of the licenses. This notice is repeated on a regular basis until the expiration date is reached. You need to renew license to view chart database after the expiration date.




When warning of license(s) expiration appears, contact your chart agent to renew your C-MAP license(s).

After expiration, charts of expired license(s) are displayed for a short period. The following Permanent message dialog box is displayed.

**Permanent message**

Some licenses of C-Map Ed3 charts are expired. Use
Chart Menu - C-Map Ed3 - Licenses - Licenses list
Order new licenses needed.

# A4.7 How to Keep Charts up to Date

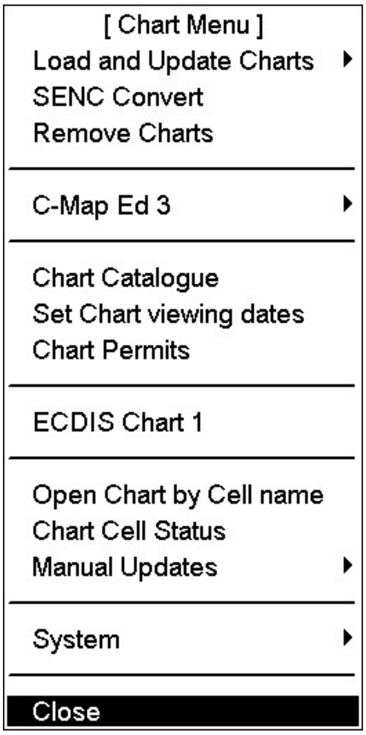
During subscription time of period, you will receive CM-93/3 Professional CD ROM onboard three times. To keep up-to-date between CD issuing period, you can use Real Time Updating service.

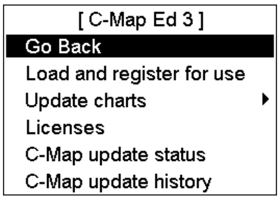
ECDIS users do not have possibility to connect to the internet directly from the ECDIS. They are able to create an update order file from the ECDIS and send this by email directly to updates@c-map.no. This automatic email server will process the update request, prepare the updates and automatically return them. The end user can then copy these updates floppy disk, USB memory stick or CD-ROM and apply them to the ECDIS.

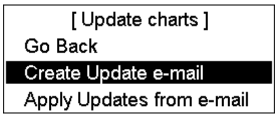
## A4.7.1 How to create update order file

You can create an update order file as follows:

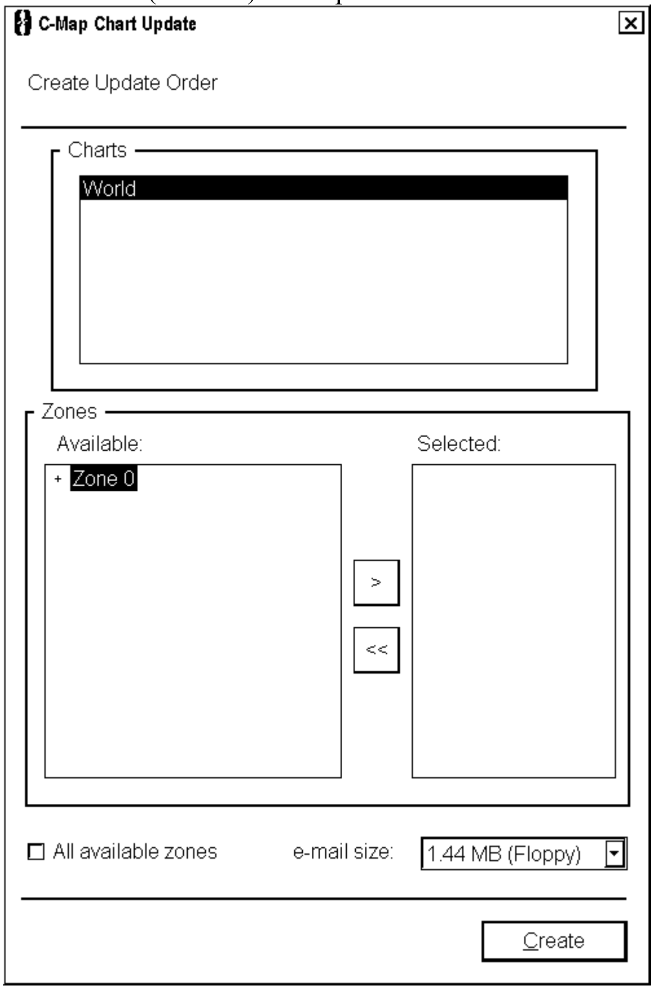
1. Open the Chart menu and select C-MAP Ed 3 from the menu. Select Update Charts in C-MAP Ed 3 menu.



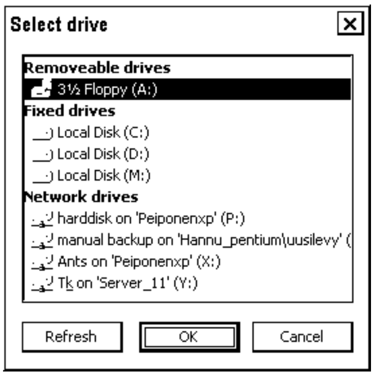



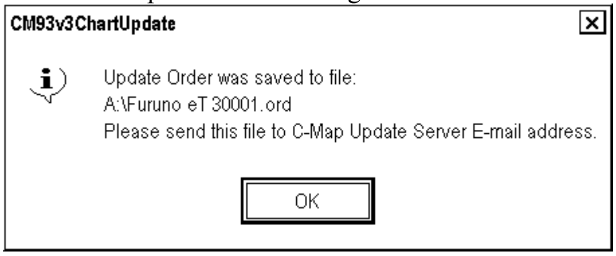
2. Select Zones (or Areas) to be updated.




3. Click the **Create** button then select the drive where to save the Chart Update Order file.




When Chart Update Order file is generated and saved to destination, the following dialog box appears:



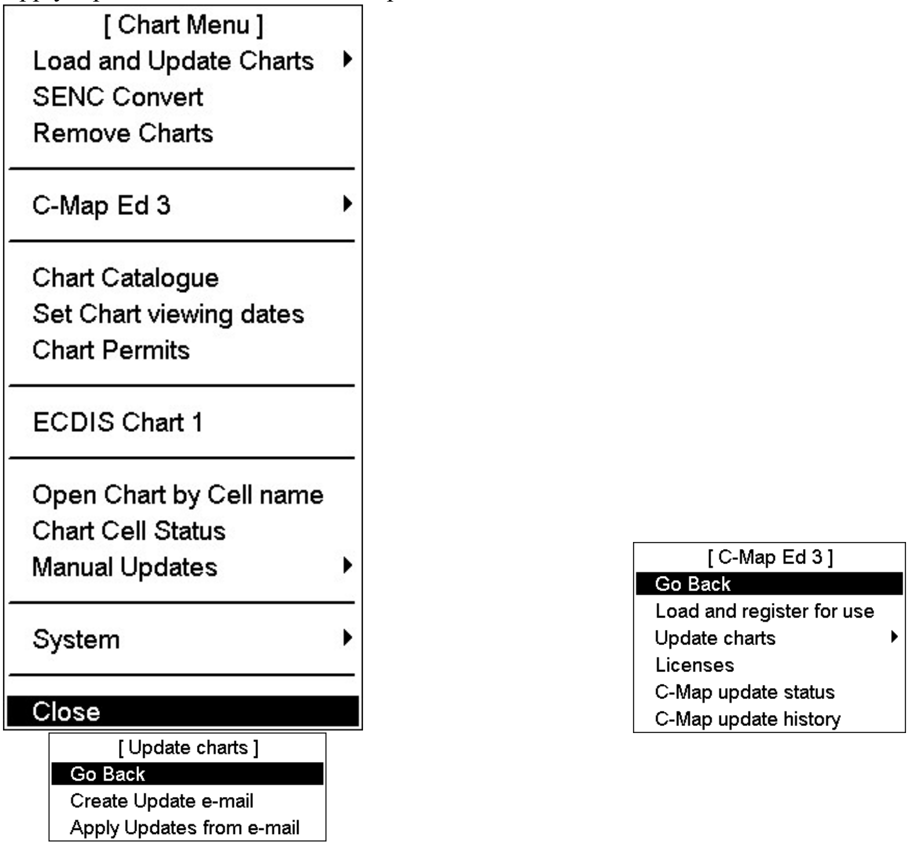

4. Click the **OK** button. Update order file to address updates@C-MAP.no

You will receive updates for your request automatically.

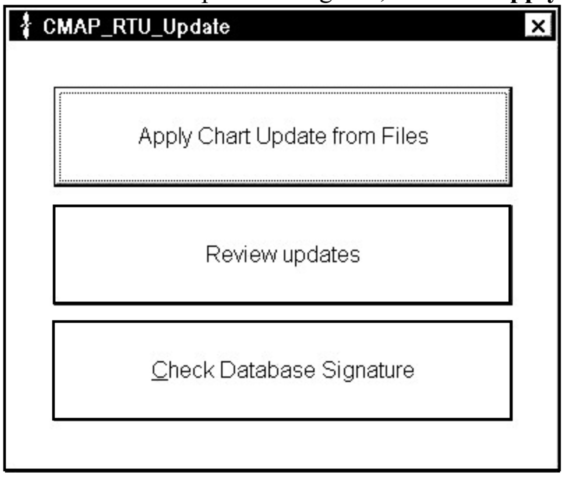
## A4.7.2 How to load chart updates from the file

When you have received an update file via e-mail, then you can load it to ECDIS.

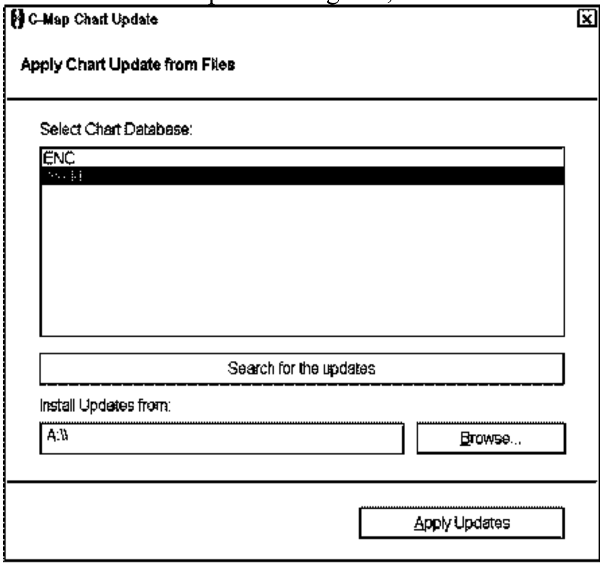
1. Open the Chart menu and select C-MAP Ed 3 in the menu. Select Update Charts in C-MAP Ed 3 menu and Apply Updates from e-mail in the Update charts menu.



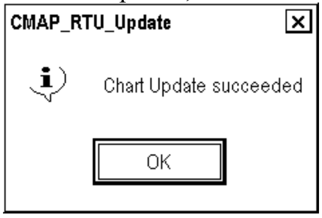

2. In C-MAP RTU Update dialog box, click the **Apply Chart Update from Files** button.



3. In C-MAP Chart Update dialog box, select drive where updates are saved and click the **Apply Updates** button.



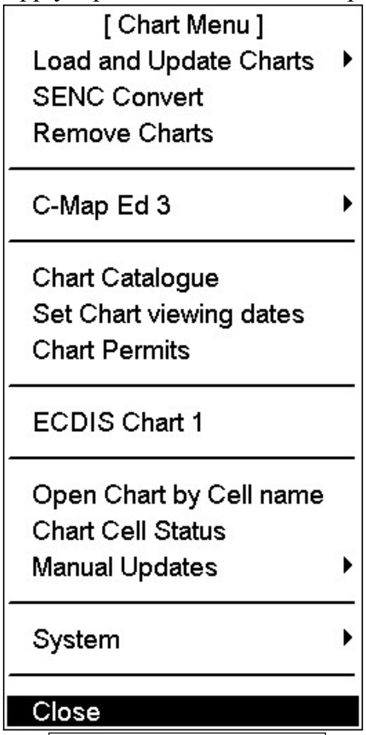

4. When completed, the following dialog box appears. Click the **OK** button.

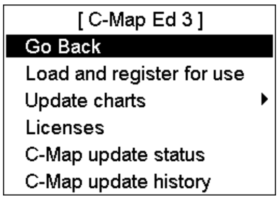


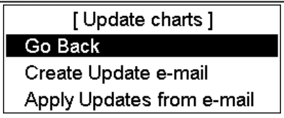

## A4.7.3 How to review chart updates

You can see a list of changes for every updated chart as follows:

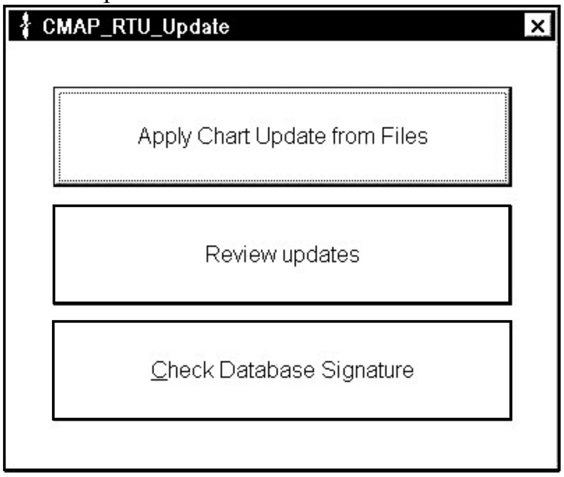
1. Open the Chart menu and select C-MAP Ed 3 in the menu. Select Update Charts in C-MAP Ed 3 menu and Apply Updates from e-mail in Update charts menu.



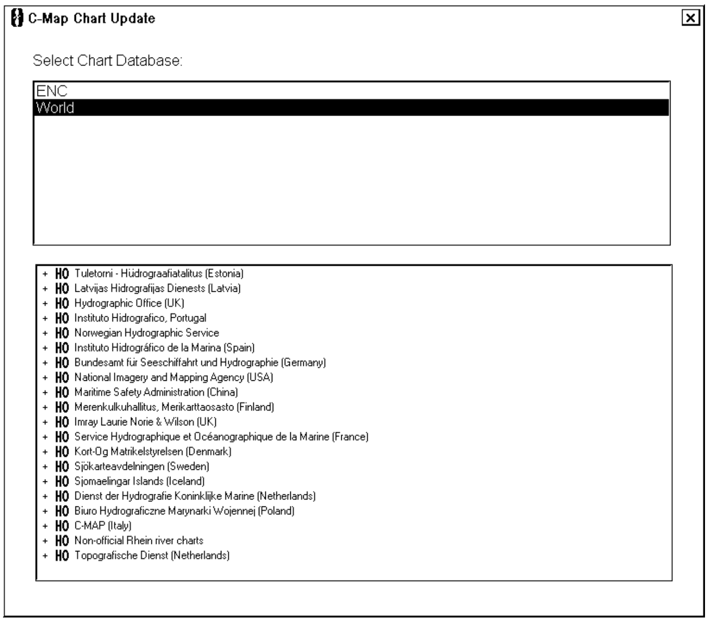



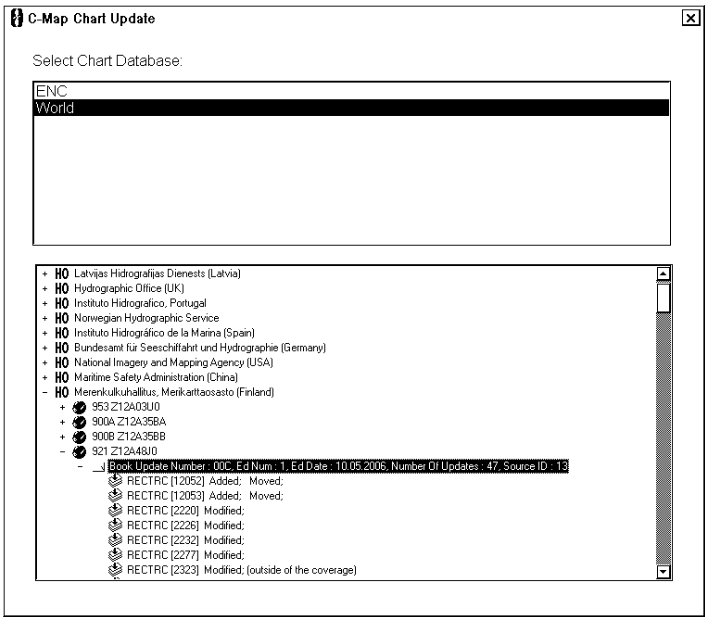
2. Review updates in text mode and click the **Review updates** button.




3. Select from the list shown below.

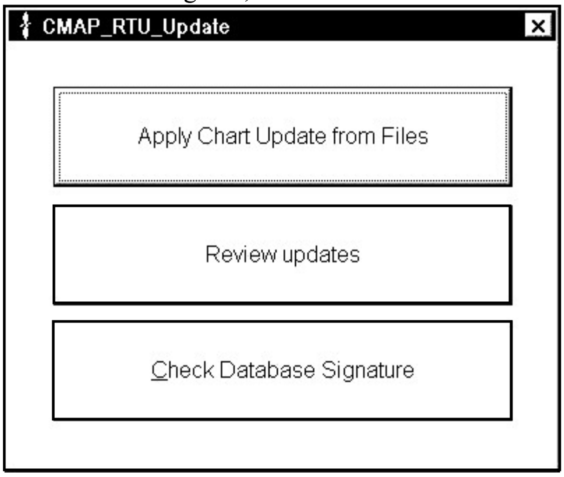



4. Select a chart from the list.



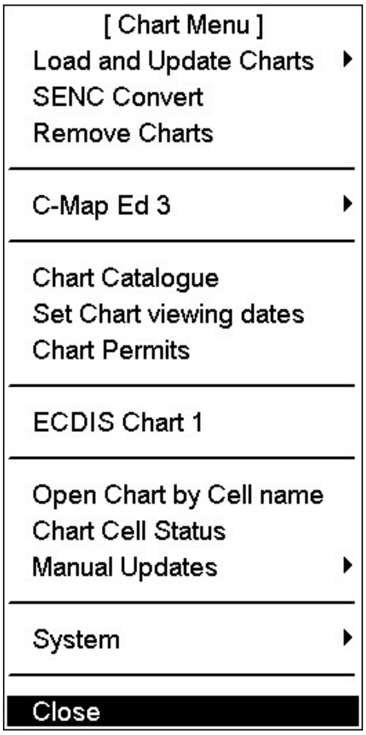

5. Click the **X** button.

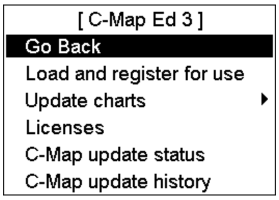
6. In the RTU dialog box, click the **X** button.



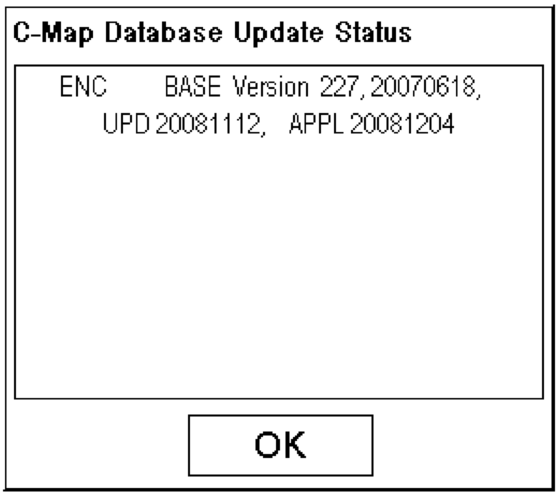

## A4.7.4 How to view update status of CM93/3 charts

1. Open the Chart menu and select C-Map Ed 3 from the menu. Select C-Map Update Status in C-Map Ed. 3 menu.




2. C-Map Database Update Status dialog appears.
   :

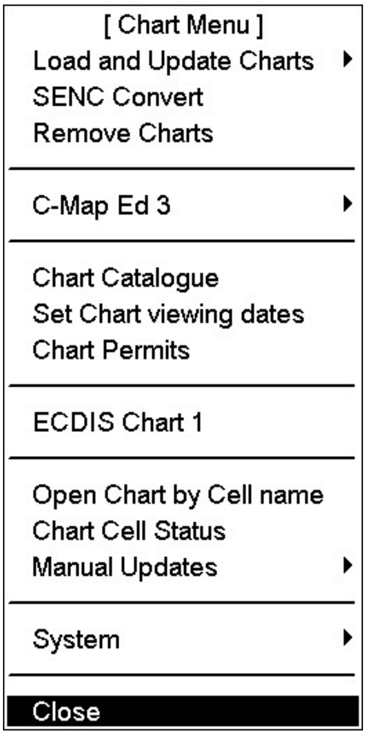


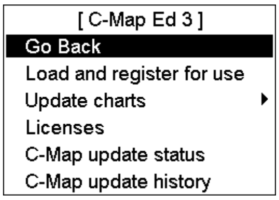

The Following information is available:
- Database version number (ENC version 227)
- Date of Update file processed (UPD 20081112) for database above using RTU
- Date of Update file loaded to ECDIS (APPL 20081204)

3. Click OK to close dialog.

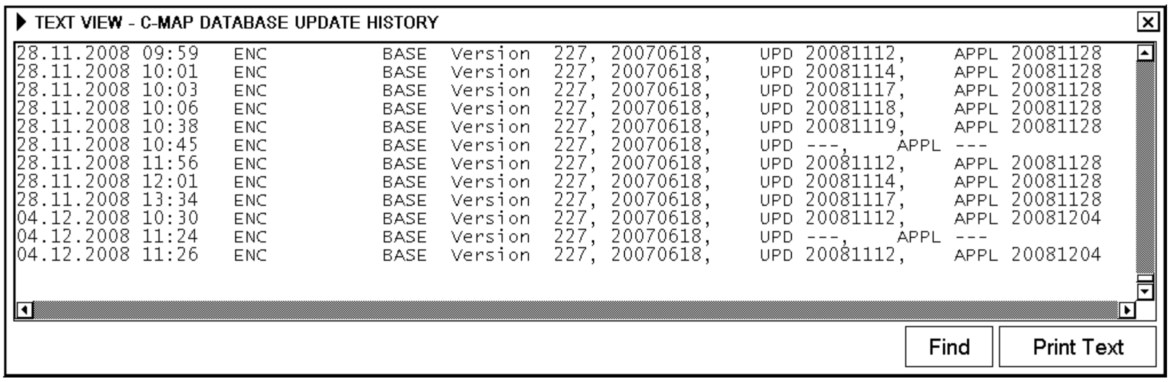
## A4.7.5 How to view update history of CM93/3 charts

1. Open the Chart menu and select C-Map Ed 3 from the menu. Select C-Map Update Status in C-Map Ed. 3 menu.




2. C-Map Database Update history viewer appears.



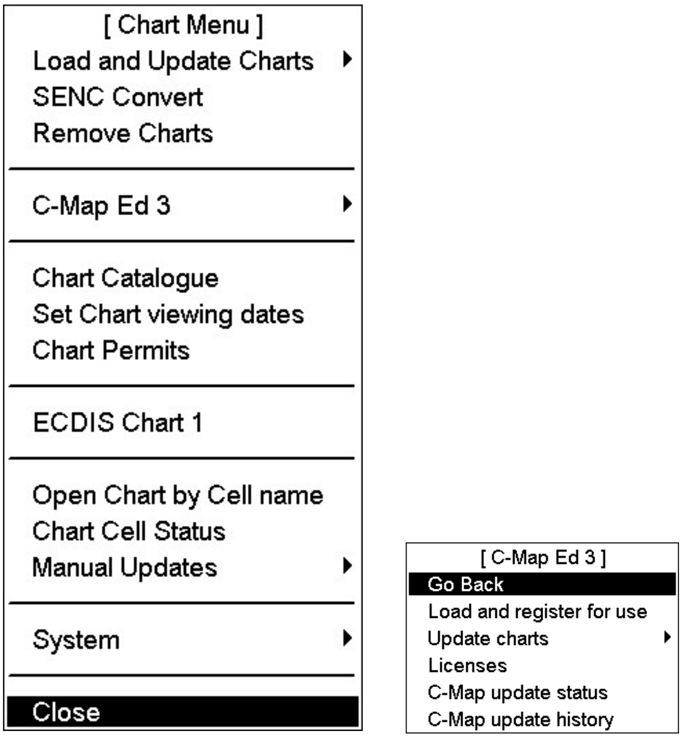

The following information is available:
- Loading date of Database with version number (ENC BASE version 227, date)
- Date of Update file processed (UPD) for database above using RTU
- Date of Update file loaded to ECDIS (APPL)

3. Click OK to close dialog.

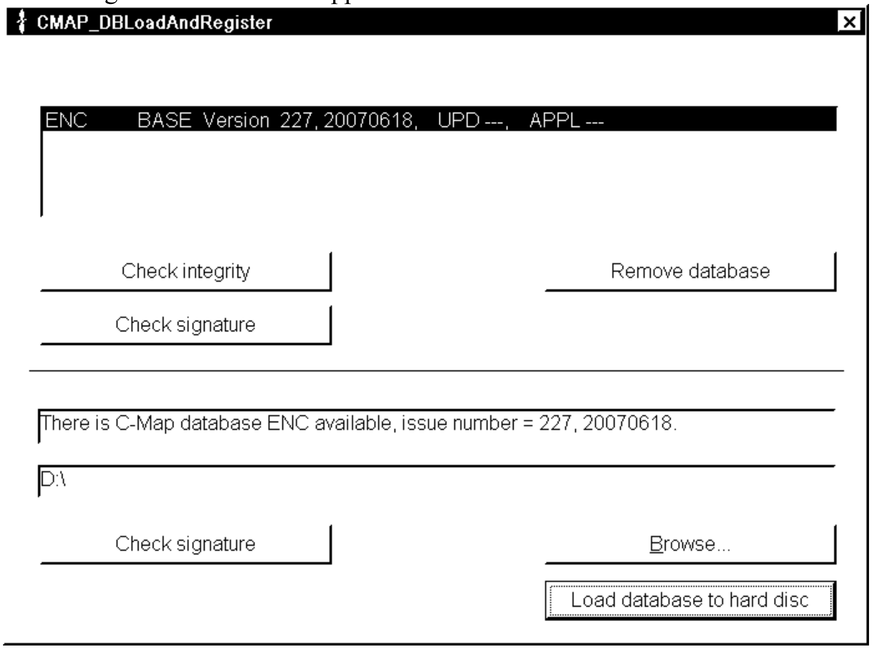
# A4.8 How to Remove CM93/3 Charts

You can remove CM93/3 charts from ECDIS using Unregister. This will remove license and entire database from ECDIS.

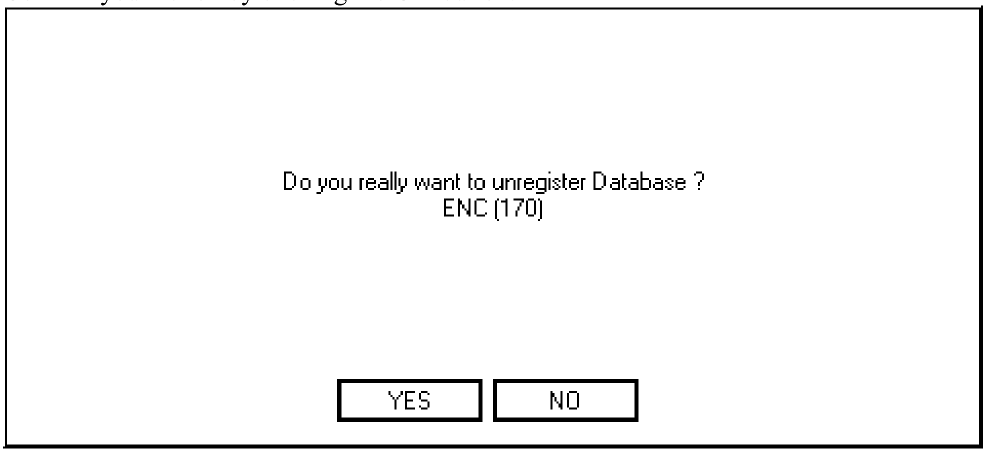
1. Open the Chart menu and select C-MAP Ed 3 from the menu. Select Load and register for use from the C-MAP Ed 3 menu.




2. The dialog box shown below appears. Select desired database.



3. Confirm your action by clicking the **OK** button.




4. Close CM-93/3 Database Administrator dialog box by clicking **X** in upper right corner.

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# Appendix 5: Digital Interface

## Digital Interface

### Input sentence

ABK, ACK, DBS, DBT, DPT, DTM, GGA, GLL, GNS, HDT, MTW, MWV, NRX, RMC, ROT, THS, VBW, VDR, VHW, VTG, ZDA, !AIVDM, !AIVDO, $AIALR

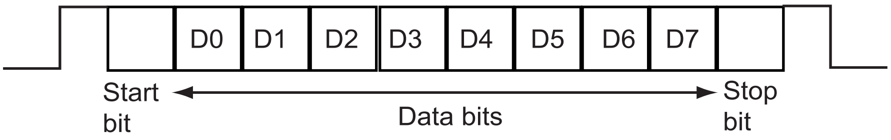
### Output sentences

ABM, ALR, BBM, OSD, SSD, TLB, TTD, TTM, RSD, VSD

### Data reception

Data is received in serial asynchronous form in accordance with the standard referenced in IEC 61162-2.

The following parameters are used:
Baud rate: 38,400 bps: HDT, THS, !AIVDM, !AIVDO and $AIALR. All other sentences: 4800 bps
Data bits: 8 (D7 = 0), Parity: none, Stop bits: 1




### Validity and integrity of input data (mode indicator)

| Data indication | HDG | Latitude and Longitude | SPD | COG/SOG |
|---|---|---|---|---|
| GREEN color<br>(normal data) | THS-A<br>HDT | GNS-A,D<br>GGA-1 2,3<br>GLL-A, D and (status: A)<br>RMC- A, D and (status: A) | VBW-A<br>VHW | VTG-A, D |
| no indication | THS-E, M, S, V | GNS-E, M, S, N<br>GGA-0, 4, 5, 6, 7, 8<br>GLL-E, M, S, N or (status:V)<br>RMC-E, M, S, N or (status:V) | VBW-V | VTG-E, M, S, N |

# Data Sentences

Data used is shown in bold italics.

## Input sentences

**ABK - UAIS Addressed and binary broadcast acknowledgement**

```
$--ABK,xxxxxxxxx,x,x.x,x,x*hh<CR><LF>
          |        |  |   | | |
          |        |  |   | | +--- 6
          |        |  |   | +----- 5
          |        |  |   +------- 4
          |        |  +---------- 3
          |        +------------- 2
          +------------------- 1
```

1. MMSI of the addressed AIS unit
2. AIS channel of reception
3. Message type
4. Message sequence number
5. Type of acknowledgement

**ACK - Acknowledge alarm**

Recipient of sentences:

Expected nominal interval of sentences: 60 s

Alarm generated if message not received: 130 s

```
$--ACK,x.x,x.*hh<CR><LF>
        |      +------------ 2
        +------------------- 1
```

1. ***Local alarm number (identifier)***
2. ***Checksum***

**DTM - Datum reference**

Recipient of sentences:

Expected nominal interval of sentences: 15 s

Alarm generated if message not received: 60 s ± 10 s

```
$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc*hh<CR><LF>
                |  |  |    | |   |  |    |   |
                |  |  |    | |   |  |    |  +--- 7
                |  |  |    | |   |  |   +------ 6
                |  |  |    | |   | +---------- 5
                |  |  |    | +--+------------- 4
                |  | +---+------------------- 3
                | +------------------------- 2
                +---------------------------- 1
```

***1. Local datum W84*** - WGS84
W72 - WGS72
S85 - SGS85
P90 - PE90
999 - User defined
IHO datum code

2. Local datum subdivision code
3. Lat offset, min, N/S
4. Lon offset, min, E/W
5. Altitude offset, m
6. Reference dattum W84 - WGS84
W72 - WGS72
S85 - SGS85
P90 - PE90

***7. Checksum***

**DBS - Depth below surface**

```
$--DBS,x.x,f,x.x,M,x.x,F*hh<CR><LF>
              |  |  |   |   |  |  |
              |  |  |   |   |  |  +--------- 4
              |  |  |   | +--+----------- 3
              |  | +--+----------------- 2
             +--+---------------------- 1
```

***1. Water depth, feet***
***2. Water depth, m***
***3. Water depth, fathoms***
***4. Checksum***

**DBT - Depth below transducer**

Recipient of sentences:

Expected nominal interval of sentences: 5 s

Alarm generated if message not received: 22 s ± 2 **s**

```
$--DBT,x.x,f,x.x,M,x.x,F*hh<CR><LF>
          |  |  |   |   |  |  |
          |  |  |   |   |  |  +--------- 4
          |  |  |   |  +--+----------- 3
          |  |  +--+----------------- 2
         +--+--------------------- 1
```

***1. Water depth, feet***
***2. Water depth, m***
***3. Water depth, fathoms***
***4. Checksum***

**DPT - Depth**

Recipient of sentences:

Expected nominal interval of sentences: 5 s

Alarm generated if message not received: 22 s ± 2 s

```
$--DPT,x.x,x.x,x.x*hh<CR><LF>
          |    |    |   |
          |    |    |  +----- 4
          |    |   +--------- 3
          |   +------------ 2
          +---------------- 1
```

***1. Water depth relative to trancsducer, in meters***
2. Offset from transeducer, in meters (see notes 1 and 2)
3. Maximum range scale in use
***4. Checksum***

NOTE1 "positive"=distance from transeduser to water-line.
"-"=distance from transducer to keel.
NOTE2 For IEC applications the offset should always be applied so as to provide depth relative to the keel.

**GGA - Global positioning system fix data**

Recipient of sentences:

Expected nominal interval of sentences: 1 - 5 s

Alarm generated if message not received: 22 s ± 2 s

```
$--GGA,hhmmss.ss,llll.lll,a,yyyyy.yyy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>
       |         |        | |         | | |  |   |   | |   | |   |   |
       |         |        | |         | | |  |   |   | |   | |   |   +-- 11
       |         |        | |         | | |  |   |   | |   | |   +---- 10
       |         |        | |         | | |  |   |   | |   | +--------- 9
       |         |        | |         | | |  |   |   | +---+------------ 8
       |         |        | |         | | |  |   +---+------------------ 7
       |         |        | |         | | |  +------------------------- 6
       |         |        | |         | | +---------------------------- 5
       |         |        | |         | +------------------------------ 4
       |         |        | +---------+-------------------------------- 3
       |         +--------+------------------------------------------- 2
       +--------------------------------------------------------------- 1
```

1. UTC of position
2. ***Latitude, N/S***
3. ***Longitude, E/W***
4. ***GPS quality indicator (see note)***
5. Number of satellite in use,00-12, may be different from the number in view
6. Horizontal dilution of precision
7. Antenna altitude above/below mean sealevel, m
8. Geoidal separation, m
9. Age of differential GPS data
10. Differential reference station ID, 0000-1023
11. ***Checksum***

NOTE
0 = fix not available or invalid
***1 = GPS SPS mode, fix valid***
***2 = differential GPS, SPS mode, fix valid***
***3 = GPS PPS mode, fix valid***
4 = Real Time Kinetic. Satellite system used in RTK mode with fixed integers
5 = Float RTK. Satellite system used in RTK mode with floating fingers
6 = Estimated (dead reckoning) mode
7 = Manual input mode
8 = Simulator mode
The GPS quality indicator shall not be a null field.
Position data shown in green in case of 1, 2 and 3; no indication in case of "0" and "4-8".

**GLL - Geographic position, latitude/longitude**

Recipient of sentences:

Expected nominal interval of sentences: 1 - 5 s

Alarm generated if message not received: 22 s ± 2 s

```
$--GLL,llll.lll,a,yyyyy.yyy,a,hhmmss.ss,A,a*hh<CR><LF>
        |    |      |     |         |    |  |  |
        |    |      |     |         |    |  |  +------- 6
        |    |      |     |         |    |  +--------- 5
        |    |      |     |         |    +----------- 4
        |    |      |     |         +---------------- 3
        |    |      +------+---------------------- 2
        +---+---------------------------------- 1
```

***1. Latitude, N/S***
***2. Longitude, E/W***
3. UTC of position
***4. Status: A=data valid, V=data invalid***
***5. Mode indicator(see note)***
***6. Checksum***

NOTE  Positioning system Mode indicator:

***A = Autonomous***
***D = Differential***
E = Estimated (dead reckoning)
M = Manual input
S = Simulator
N = Data not valid

The Mode indicator field supplements the Status field. The Status field shall be set to V=invalid for all values of Operating Mode except for A=Autonomous and D=Differential. The positioning system Mode indicator and Status field shall not be null fields.
Position data shown in green in case of A=data valid and A and D; no indication in case of V=data invalid, E, M, S and N.

**GNS - GNSS fix data**

Recipient of sentences:

Expected nominal interval of sentences: 1 - 5 s

Alarm generated if message not received: 22 s ± 2 s

```
$--GNS,hhmmss.ss,llll.lll,a,yyyyy.yyy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>
           |          |   |     |      |  |   |  |   |  |  |   |   |
           |          |   |     |      |  |   |  |   |  |  |   |   +--- 11
           |          |   |     |      |  |   |  |   |  |  |   +------ 10
           |          |   |     |      |  |   |  |   |  |  +---------- 9
           |          |   |     |      |  |   |  |   |  +------------- 8
           |          |   |     |      |  |   |  |   +----------------- 7
           |          |   |     |      |  |   |  +---------------------- 6
           |          |   |     |      |  |   +------------------------- 5
           |          |   |     |      |  +------------------------------ 4
           |          |   |     +-------+--------------------------------- 3
           |          +---+------------------------------------------ 2
           +------------------------------------------------------------ 1
```

1. UTC of position
2. ***Latitude, N/S***
3. ***Longitude, E/W***
4. ***Mode indicator***
5. Total number of satllite in use,00-99
6. HDOP
7. Antenna altitude, metres, re:mean-sea-level(geoid)
8. Geoidal separation
9. Age of differential data
10. Differential reference station ID
11. ***Checksum***

**HDT - Heading, true**

Recipient of sentences:

Data cycle should be input with more than 40 Hz (HSC) or 20 Hz (normal speed).

```
$--HDT,x.x,T*hh<CR><LF>
       |   | |
       |   | +--------- 2
       +----+----------- 1
```

1. ***Heading, degrees true***
2. ***Checksum***

**MTW - Water temperature**

Recipient of sentences:

Expected nominal interval of sentences: 5 s

Alarm generated if message not received: 22 s ± 2 s

```
$--MTW,x.x,C*hh<CR><LF>
        |   | |
        |   | +--------- 2
       +--+----------- 1
```

1. ***Temperature, degrees C***
2. ***Checksum***

**MWV - Wind speed and angle**

Recipient of sentences:

Expected nominal interval of sentences: 5 s

Alarm generated if message not received: 22 s ± 2 **s**

```
$--MWV,x.x,a,x.x,a,A*hh<CR><LF>
        |   |   |  |  |  |
        |   |   |  |  |  +--------- 6
        |   |   |  |  +----------- 5
        |   |   |  +------------- 4
        |   |   +---------------- 3
        |   +------------------- 2
        +---------------------- 1
```

1. ***Wind angle, 0 to 359 (degrees)***
2. ***Reference, R=relative, T=true***
3. ***Wind speed***
4. ***Wind speed units, KN/M/N***
5. ***Status, A=data valid, V=data invalid***
6. ***Checksum***

Data is used in case of A=data valid.
Data is not used in case of V=data invalid.

## NRX - NAVTEX received data

$--NRX,xxx,xxx,xx,aaxx,x,hhmmss.ss,xx,xx,xxxx,x.x,x.x,A,c–c*hh<CR><LF>

- *Message body (see Note 7)*
- *Status indication (see Note 6)*
- *Total number of bad characters*
- *Total number of characters in this series of NRX sentences*
- *Year (see Note 5)*
- *Month 1-12*
- *Day 1-31*
- *UTC of receipt message*
- *Frequency table index 0-9 code (see Note 4)*
- *Navtex message code (see Note 3)*
- *Sequential message id 01-99 (see Note 2)*
- *Sentence number 001-999*
- *Number of sentences 001-999 (see Note 1)*

NOTE 1 The function code is used to further identify the purpose of the sentence. The meaning of the function code is as follows:

0 – request messages for the given mask
1 – set/report the storage mask
2 – set/report the printer mask
3 – set/report the INS mask
4 to 9 – reserved for future use

NOTE 2 The frequency indicator identifies the frequency that the NAVTEX message was received on:
1 = 490 kHz
2 = 518 kHz
3 = 4209,5 kHz
4 through 9 are reserved for future use

NOTE 3 The transmitter coverage area mask is defined as a 32 bit hex field where the least significant bit represents transmitter coverage area 'A', the next bit is 'B' and so on up to bit 25 which is 'Z'. Bits 31 through 26 are reserved for future use and should be set to zero. To select a transmitter coverage area its corresponding bit should be set to one. To deselect a transmitter coverage area its corresponding bit should be set to zero.

NOTE 4 The message type mask is defined as a 32 bit hex field where the least significant bit represents message type 'A', the next bit is 'B' and so on up to bit 25 which is 'Z'. Bits 31 through 26 are reserved for future use and should be set to zero. To select a message type its corresponding bit should be set to one. To deselect a message type its corresponding bit should be set to zero.

NOTE 5 When another device (for example an INS) wishes to set one or more of the bit masks it sends one or more NRM sentences to the NAVTEX receiver. When another device wishes to determine the current values of the bit masks it sends a query sentence to the NAVTEX receiver as follows:

$--CRQ,NRM*hh<CR><LF>

On receiving this query, the NAVTEX receiver will respond with one NRM sentence for each mask type and frequency combination that it supports. For example, a NAVTEX receiver which supports separate storage, printer and INS masks for each of three receiver frequencies will return a total of nine NRM sentences in response to the above query.

**RMC - Recommended minimum specific GPS/TRANSIT data**

Recipient of sentences:

Expected nominal interval of sentences: 1 - 5 s

Alarm generated if message not received: 22 s ± 2 s

```
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yyy,a,x.x,x.x,xxxxxx,x.x,a,a*hh<CR><LF>
       |         | |       | |         | |   |   |      |   | |
       |         | |       | |         | |   |   |      |   | | +--- 10
       |         | |       | |         | |   |   |      |   | +----- 9
       |         | |       | |         | |   |   |      +---+------- 8
       |         | |       | |         | |   |   +------------------ 7
       |         | |       | |         | |   +---------------------- 6
       |         | |       | |         | +-------------------------- 5
       |         | |       | +---------+---------------------------- 4
       |         | +-------+---------------------------------------- 3
       |         +-------------------------------------------------- 2
       +------------------------------------------------------------ 1
```

1. UTC of position fix
2. *Status: A=data valid, V=navigation receiver warning*
3. *Latitude, N/S*
4. *Longitude, E/W*
5. *Speed over ground, knots*
6. *Course over ground, degrees true*
7. Date: dd/mm/yy
8. Magnetic variation, degrees E/W
9. *Mode indicator(see note)*
10. *Checksum*

NOTE Positioning system Mode indicator:

*A = Autonomous*
*D = Differential*
E = Estimated (dead reckoning)
M = Manual input
S = Simulator
N = data not valid

The Mode indicator field supplements the Status field. The Status field shall be set to V=invalid for all values of Operating Mode except for A=Autonomous and D=Differential. The positioning system Mode indicator and Status field shall not be null fields.

Data is used in case of A=data valid and A and D. Data is not used in case of V=data invalid, E, M, S and N.

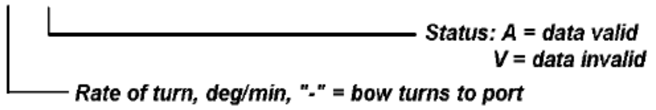
**ROT - Rate of turn**

Recipient of sentences:

Expected nominal interval of sentences: 1 s

Alarm generated if message not received: 12 s ± 2 s

$--ROT, x.x, A*hh<CR><LF>



**THS - True heading and status**

**Recipient of sentences:**

**Data cycle should be input with more than 40 Hz (HSC) or 20 Hz (normal speed).**

```
$–THS,xxx.x,a*hh<CR><LF>
            |    |   |--------------- 3
            |    |-------------- 2
            +----------- 1
```

***1. Heading, degrees true***
***2. Status***
***A: Autonomous***
E: Estimated (dead reckoning)
M: Manual input
S: Simulator mode
V: Data not valid
***3. Checksum***

**VBW - Dual ground/water speed**

Recipient of sentences:

Expected nominal interval of sentences: 5 s

Alarm generated if message not received: 22 s ± 2 **s**

```
$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,A,x.x,A*hh<CR><LF>
        |   |  |  |   |  |  |  |  |  | |
        |   |  |  |   |  |  |  |  |  | +--- 11
        |   |  |  |   |  |  |  |  |  +----- 10
        |   |  |  |   |  |  |  |  +-------- 9
        |   |  |  |   |  |  |  +----------- 8
        |   |  |  |   |  |  +-------------- 7
        |   |  |  |   |  +----------------- 6
        |   |  |  |   +-------------------- 5
        |   |  |  +------------------------ 4
        |   |  +--------------------------- 3
        |   +------------------------------ 2
        +---------------------------------- 1
```

***1. Longitudial water speed, knots***
***2. Transverse water speed, knots***
***3. Status: water speed, A=data valid* V=data invalid*****
***4. Longitudial ground speed, knots***
***5. Transverse ground speed, knots***
***6. Status: ground speed, A=data valid *V=data invalid*****
7. Stern transverse water speed, knots
8. Status: stern water speed, A=data valid V=data invalid
9. Stern transverse ground speed, knots
10. Status: stern ground speed, A=data valid V=data invalid
***11. Checksum***

*=Data shown in green
**=Data shown in blank

**VHW - Water speed and heading**

Recipient of sentences:

Expected nominal interval of sentences: 1 - 5 s

Alarm generated if message not received: 12 s ± 2 **s**

```
$--VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh<CR><LF>
       |   |  |   |  |  |  |  |  |
       |   |  |   |  |  |  |  |  +--------- 5
       |   |  |   |  |  |  +--+----------- 4
       |   |  |   |  +--+---------------- 3
       |   |  +---+---------------------- 2
       +---+---------------------------- 1
```

1. Heading, degrees true
2. Heading, degrees magnetic
3. ***Speed, knots***
4. ***Speed, km/h***
5. ***Checksum***

**VDR - Set and drift**

```
$--VDR,x.x,T,x.x,M,x.x,N*hh<CR><LF>
       | |  |  |  | |  |
       | |  |  |  | |  +--------- 4
       | |  |  |  +--+----------- 3
       | |  +--+----------------- 2
       +--+---------------------- 1
```

1. ***Direction, degrees true***
2. Direction, degrees magnetic
3. ***Current speed, knots***
4. ***Checksum***

**VTG - Course over ground and ground speed**

Recipient of sentences:

Expected nominal interval of sentences: 1 - 5 s

Alarm generated if message not received: 22 s ± 2 s

```
$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>
       |  |  |  |  |  |  |  |  |  |
       |  |  |  |  |  |  |  |  |  +------- 6
       |  |  |  |  |  |  |  |  +--------- 5
       |  |  |  |  |  |  +--+----------- 4
       |  |  |  |  +--+----------------- 3
       |  |  +--+----------------------- 2
       +--+----------------------------- 1
```

***1. Course over ground, degrees true***
2. Course over ground, degrees magnetic
***3. Speed over ground, knots***
***4. Speed over ground, km/h***
***5. Mode indicator(see note)***
***6. Checksum***

NOTE  Positioning system Mode indicator:
***A = Autonomous***
***D = Differential***
E = Estimated (dead reckoning)
M = Manual input
S = Simulator
N = Data not valid

The positioning system Mode indicator field shall not be a null field. Data shown in green in case of A and D; no indication in case of E, M, S and N.

**ZDA - Time and date**

Recipient of sentences:

Expected nominal interval of sentences: 5 s

```
$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>
          |       |  |   |   |  |  |
          |       |  |   |   |  |  +--------- 7
          |       |  |   |   |  +----------- 6
          |       |  |   |   +-------------- 5
          |       |  |   +------------------ 4
          |       |  +--------------------- 3
          |       +------------------------ 2
          +-------------------------------- 1
```

***1. UTC***
***2. Day, 01 to 31 (UTC)***
***3. Month, 01 to 12 (UTC)***
***4. Year (UTC)***
5. Local zone hours, 00h to +-13h
6. Local zone minutes, 00 to +59
as local hours
***7. Checksum***

**$AIALR - Set alarm state**

```
$AIALR,hhmmss.ss,xxx,A,A,c--c*hh<CR><LF>
        |         |  |  |  |   |
        |         |  |  |  |   +----------------- 6
        |         |  |  |  +----------------- 5
        |         |  |  +------------------- 4
        |         |  +--------------------- 3
        |         +------------------------- 2
        +--------------------------------- 1
```

1. Time of alarm condition change, UTC
2. Local alarm number (identifier)
3. ***Alarm condition (A=threshold exceeded, V=not exceeded)***
4. ***Alarm's acknowledge state, A=acknowledged V=unacknowledged***
5. ***Alarm's description text***
6. ***Checksum***

**!AIVDM - VHF data-link message**

Expected nominal interval between sentences: as specified by IMO for AIS transponder.

```
!AIVDM,x,x,x,a,s--s,x*hh<CR><LF>
       | | | |   |  |  |
       | | | |   |  |  +----- 7
       | | | |   |  +----- 6
       | | | |   +-------- 5
       | | | +------------ 4
       | | +-------------- 3
       | +---------------- 2
       +------------------ 1
```

1. ***Total number of sentences needed to transfer the message, 1 to 9***
2. ***Message sentence number, 1 to 9***
3. ***Sequential message identifier, 0 to 9***
4. AIS channel Number
5. ***Encapsulated ITU-R M.1371 radio message****
6. ***Number of fill-bits, 0 to 5***
7. ***Checksum***

*= Message no.1, 2, 3, 4, 5, 9, 12, 14, 18, 19, 21 and 24 are used.

**!AIVDO - UAIS VHF Data-link Own-vessel report**

```
!AIVDO,x,x,x,a,s--s,x*hh<CR><LF>
          | | | |   | | |
          | | | |   | | +--- 7
          | | | |   | +----- 6
          | | | |   +-------- 5
          | | | +------------ 4
          | | +-------------- 3
          | +---------------- 2
          +------------------ 1
```

1. *Total number of sentences needed to transfer the message, 1 to 9*
2. *Message sentence number, 1 to 9*
3. *Sequential message identifier, 0 to 9*
4. AIS channel Number
5. *Encapsulated ITU-R M.1371 radio message**
6. *Number of fill-bits, 0 to 5*
7. *Checksum*

*= Data are MMSI no., navigation status, ETA, destination, draught, type of ship, call sign, ship's name and GPS antenna position.

## Output sentences

**ABM - UAIS Addressed binary and safety related message**

Transmit of sentences:

Expected nominal interval of sentences: on demand

```
!--ABM,x,x,x,xxxxxxxxx,x,xx,s--s,x*hh<CR><LF>
       | | |    |      | |  |   | |
       | | |    |      | |  |   | +--- 9
       | | |    |      | |  |   +----- 8
       | | |    |      | |  +-------- 7
       | | |    |      | +----------- 6
       | | |    |      +-------------- 5
       | | |    +-------------------- 4
       | | +-------------------------- 3
       | +---------------------------- 2
       +------------------------------ 1
```

1. *Total number of sentences needed to transfer the message, 1 to 9*
2. *Message sentence number, 1 to 9*
3. *Message sequence identifier, 0 to 3*
4. *The MMSI of destination AIS unit for the ITU-R M.1371 message 6 or 12*
5. *AIS channel for broadcast of the radio message*
6. *VDL message number(6 or 12), see ITU-R M.1371*
7. *Encapsulated data*
8. *Number of fill-bits, 0 to 5*
9. *Checksum*

**ALR- Set alarm state**

Transmit of sentences:

Expected nominal interval of sentences: 30 s

```
$--ALR,hhmmss.ss,xxx,A,A,c--c*hh<CR><LF>
         |        |  |  |  |   |
         |        |  |  |  |   +------------- 6
         |        |  |  |  +----------------- 5
         |        |  |  +-------------------- 4
         |        |  +----------------------- 3
         |        +-------------------------- 2
         +----------------------------------- 1
```

*1. Time of alarm condition change, UTC*
*2. Local alarm number(identifier)*
*3. Alarm condition(A=threshold exceeded, V=not exceeded)*
*4. Alarm’s acknowledge state, A=acknowledged V=unacknowledged*
*5. Alarm’s description text*
*6. Checksum*

**BBM - UAIS Broadcast binary message**

Transmit of sentences:

Expected nominal interval of sentences: on demand

```
!--BBM,x,x,x,x,xx,s--s,x*hh<CR><LF>
       | | | |  |   |  | |
       | | | |  |   |  | +--- 8
       | | | |  |   |  +------ 7
       | | | |  |   +--------- 6
       | | | |  +------------- 5
       | | | +---------------- 4
       | | +------------------ 3
       | +-------------------- 2
       +---------------------- 1
```

*1. Total number of sentences needed to transfer the message, 1 to 9*
*2. Message sentence number, 1 to 9*
*3. Sequential Message identifier, 0 to 9*
*4. AIS channel for broadcast of the radio message*
*5. VDL message number(8,14,19 or 21), see ITU-R M.1371*
*6. Binary data*
*7. Number of fill-bits, 0 to 5*
*8. Checksum*

**OSD- Own ship data**

```
$--OSD,x.x,A,x.x,a,x.x,a,x.x,x.x,a*hh<CR><LF>
           |  |   |   |  |  |   |   |   |   |
           |  |   |   |  |  |   |   |   |   +--------- 10
           |  |   |   |  |  |   |   |   +----------- 9
           |  |   |   |  |  |   |   +-------------- 8
           |  |   |   |  |  |   +------------------ 7
           |  |   |   |  |  +--------------------- 6
           |  |   |   |  +------------------------ 5
           |  |   |   +---------------------------- 4
           |  |   +------------------------------ 3
           |  +---------------------------------- 2
           +------------------------------------ 1
```

***1. Heading, degrees true***
***2. Heading status: A=data valid, V=data invalid***
***3. Vessel course, degrees true***
***4. Course reference, B/M/W/R/P (see note)***
***5. Vessel soeed***
***6. Speed refereence, B/M/W/R/P (see note)***
***7. Vessel set, degrees true---Manually entered***
***8. Vessel drift (speed) ---Manually entered***
***9. Speed units, K(km/h) / N(Knots) / S(statute miles/h)***
***10. Checksum***

NOTES - Reference systems (speed/course):
B = bottom tracking log
M = manually entered
W = water referenced
R = radar tracking (of fixed target)
P = positioning system ground reference

**RSD - Radar system data**

```
$RARSD,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,a,a*hh<CR><LF>
            |   |   |   |   |   |   |   |   |   |   |   | | |
            |   |   |   |   |   |   |   |   |   |   |   | | +----- 14
            |   |   |   |   |   |   |   |   |   |   |   | +------- 13
            |   |   |   |   |   |   |   |   |   |   |   +--------- 12
            |   |   |   |   |   |   |   |   |   |   +------------ 11
            |   |   |   |   |   |   |   |   |   +---------------- 10
            |   |   |   |   |   |   |   |   +-------------------- 9
            |   |   |   |   |   |   |   +------------------------ 8
            |   |   |   |   |   |   +---------------------------- 7
            |   |   |   |   |   +-------------------------------- 6
            |   |   |   |   +------------------------------------ 5
            |   |   |   +---------------------------------------- 4
            |   |   +-------------------------------------------- 3
            |   +------------------------------------------------ 2
            +---------------------------------------------------- 1
```

***1. Origin 1 range, from own ship (see note 2)***
***2. Origin 1 bearing, degrees from 0 (see note 2)***
***3. Variable range maker 1(VRM1), range***
***4. Bearing line 1(EBL1), degrees from 0***
***5. Origin 2 range (see note 2)***
***6. Origin 2 bearing (see note 2)***
***7. VRM2, range***
***8. EBL2, degrees***
***9. Cursor range, from own ship***
***10. Cursor bearing, degrees clockwise from 0***
***11. Range scale in use***
***12. Range units, K/N/S***
***13. Display rotation (see note 1)***
***14. Checksum***

NOTES
1 Display rotation:
C = course-up, course-over-ground up, degrees true
H = head-up, ship's heading(center-line) 0 up
N = north-up, true north is 0 up
2 Origin 1 and origin 2 are located at the stated range and bearing from own ship and provide for two independent sets of variable range markers (VRM) and electronic bearing lines (EBL) originating away from own ship position.

**SSD - AIS ship static data**

Transmit of sentences:

Expected nominal interval of sentences: on demand

**SSD □AIS ship static data**

Transmit of sentences:

Expected nominal interval of sentences: on demand

$--SSD,c—c,c—c,xxx,xxx,xx,xx,c,aa*hh<CR><LF>

- *Source identifier (see Note 5)*
- *DTE indicator flag (see Note 4)*
- *Pos. ref., point dist. "D," from starboard beam 0 TO 63 m (see Note 3)*
- *Pos. ref., point dist. "C," from port beam 0 TO 63 m (see Note 3)*
- *Pos. ref., point dist. "B," from stern 0 TO 511 m (see Note 3)*
- *Pos. ref., point dist. "B," from stern 0 TO 511 m (see Note 3)*
- *Ship's name, 1 to 20 characters (see Note 2)*
- *Ship's call sign, 1 to 7 characters (see Note 1)*

NOTE 1 Ship's call sign. A null field indicates that the previously entered call sign is unchanged. The string of characters "@@@@@@@" is used to indicate that the call sign is not available.

NOTE 2 The characters that can be used in the name are listed in the ITU-R M.1371, 6-bit ASCI. Some of the acceptable characters in this 6-bit ASCI table are the reserved characters within this standard IEC 61162-1, Table 1. These characters should be represented using the "^" method (see 7.1.3). A null field indicates that the previously entered name is unchanged. The string of characters "@@@@@@@@@@@@@@@@@@@@" is used to indicate that the ship's name is not available.

NOTE 3 These are the four dimensions from the bow, stern, port beam, and starboard beam to the horizontal reference point on the ship for which the current "position reports" are valid. The sum of A + B is the length of the ship in metres, and the sum of C + D is the width of the ship in metres. Refer to the ITU-R M.1371, Message 5, "reference point for reported position and dimensions of ship." If the reference point of "reported position" is not available, but the dimensions of the ship are available: A = C = 0 and B > 0 and D > 0. If neither the reference point for the reported position nor the dimensions of the ship are available: A = B = C = D = 0 (default). Use of a null field for A, B, C, and/or D indicates that the previously entered dimension for that parameter is unchanged. In many cases, the ship's reference point for "reported position" will be the location of the positioning antenna.

NOTE 4 The DTE indicator is an abbreviation for data terminal equipment indicator. The purpose of the DTE indicator is to inform distant receiving applications that, if set to "available," the transmitting station conforms, at least, to the minimum keyboard and display requirements. The DTE indicator is only used as information provided to the application layer – indicating that the transmitting station is available for communications. On the transmitting side, the DTE indicator may be set by an external application using this sentence. DTE indicator flag values are:

0 = Keyboard and display are a standard configuration, and communication is supported.

1 = Keyboard and display are either unknown or unable to support communication.

NOTE 5 The source identifier contains the talker ID of the equipment at this location.

**TLB - Target label**

```
$--TLB,x.x,c--c,x.x,c--c,......x.x,c--c*hh<CR><LF>
            |     |    |    |          |     |    |
            |     |    |    |          |     |    +--- 4
            |     |    +----+--------+----+------ 3
            |     +------------------------------ 2
            +----------------------------------- 1
```

***1. Target number ’n’ reported by the device***
***2. Label assigned to target ’n’***
***3. Additional label pairs***
***4. Checksum***

**TTD - Tracked target data**

```
$--TTD,hh,hh.x,s--s,a,x*hh<CR><LF>
             |  |  |   |      |
             |  |  |   |      +----- 5
             |  |  |  +------- 4
             |  |  +------- 3
             |  +----- 2
             +-----1
```

1. ***Total hex number of sentences need to transfer the messages***
2. ***Hex sentence number, 1 to FF***
3. ***Sequential message identifier, 0 to 9***
4. ***Encapsulated tracked target data***
5. ***Number of fill bits, 0 to 5***

**TTM - Tracked target message**

```
$--TTM,x.x,x.x,x.x,a,x.x,x.x,a,x.x,x.x,a,c--c,a,a,hhmmss.ss,a*hh<CR><LF>
      |   |   |   | |   |   | |   |   | |    | | |         | |
      |   |   |   | |   |   | |   |   | |    | | |         | +----- 14
      |   |   |   | |   |   | |   |   | |    | | |         +------- 13
      |   |   |   | |   |   | |   |   | |    | | +-------------- 12
      |   |   |   | |   |   | |   |   | |    | +------------------ 11
      |   |   |   | |   |   | |   |   | |    +-------------------- 10
      |   |   |   | |   |   | |   |   | +------------------------ 9
      |   |   |   | |   |   | |   |   +-------------------------- 8
      |   |   |   | |   |   | |   +------------------------------ 7
      |   |   |   | |   |   | +---------------------------------- 6
      |   |   |   | |   +---+---------------------------------- 5
      |   |   |   | +------------------------------------------ 4
      |   |   +---+-------------------------------------------- 3
      |   +---------------------------------------------------- 2
      +-------------------------------------------------------- 1
```

***1. Target number, 00 to 99***
***2. Target distance from own ship***
***3. Bearing from own ship, degrees, true/relative (T/R)***
***4. Target speed***
***5. Target course, degrees true/relative (T/R)***
***6. Distance of closet point of approach***
***7. Time to CPA, min., "-"increasing***
***8. Speed/distance units, K/N/S***
9. User data (e.g. target name)
***10. Target status (see note)***
***11. Reference target = R, null otherwise***
12. Time of data (UTC)
***13. Type of acquisition A=automatic, M=manual, R=reported***
***14. Checksum***

NOTE - Target status:
- L = lost, tracked target has been lost
- Q = query, target in the process of acquisition
- T = tracking

**VSD - UAIS Voyage static data**

Transmit of sentences:

Expected nominal interval of sentences: on demand

```
$--VSD,x.x,x.x,x.x,c--c,hhmmss.ss,xx,xx,x.x,x.x*hh<CR><LF>
     |   |   |   |         |       |  |  |   |  |
     |   |   |   |         |       |  |  |   |  +--- 10
     |   |   |   |         |       |  |  |   +------ 9
     |   |   |   |         |       |  |  +--------- 8
     |   |   |   |         |       |  +----------- 7
     |   |   |   |         |       +------------- 6
     |   |   |   |         +------------------- 5
     |   |   |   +------------------------- 4
     |   |   +---------------------------- 3
     |   +------------------------------- 2
     +---------------------------------- 1
```

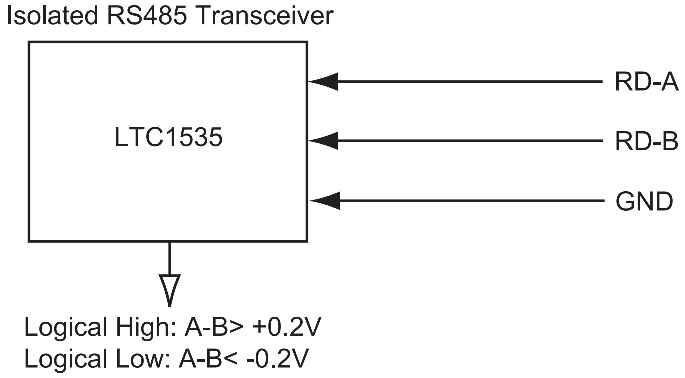
1. ***Type of ship and cargo category, 0 to 255***
2. ***Maximum present static draught, 0 to 25.5 Meters***
3. ***Persons on-board, 0 to 8191***
4. ***Destination, 1-20 characters***
5. ***Estimated UTC of arrival at destination***
6. ***Estimated day of arrival at destination, 00 to 31(UTC)***
7. ***Estimated month of arrival at destination, 00 to 12(UTC)***
8. ***Navigational status, 0 to 15***
9. ***Regional application flags, 0 to 15***
10. ***Checksum***

# Serial Interface

## Radar processor unit: Input ports

### *Heading sensor*

**Baud rate is fixed at 38.4 kbps. Complies with IEC 61162-2.**




**<u>Absolute maximum rating</u>**

<u>Input</u>

Forward current: 50 mA

Reverse voltage: 6 V

<u>Output</u>

Supply voltage: 16 V

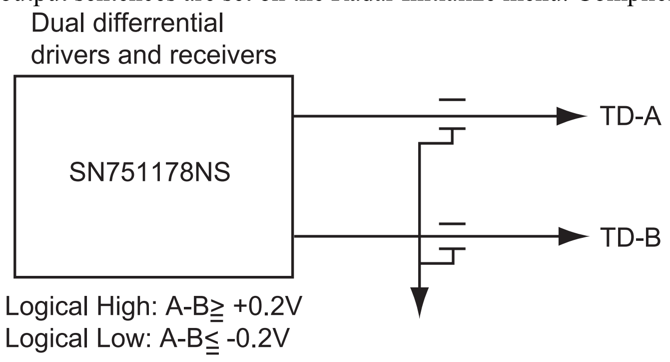
High level output voltage: 16 V

Low level output current: 50 mA

## Radar processor unit: output ports

### *TT for ECDIS*

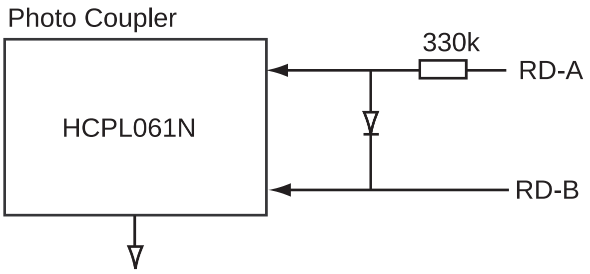
Baud rate for output sentences are set on the Radar Initialize menu. Complies with IEC 61162-1.




## LAN adapter: input ports

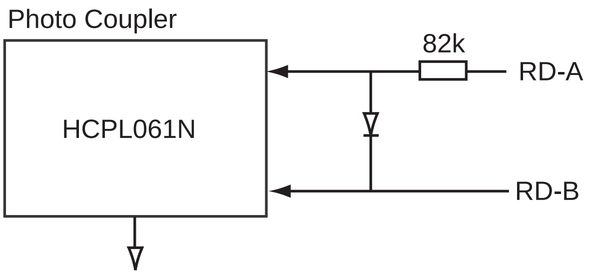
### *Log, wind, depth and navigation sensors*

Baud rate is fixed at 4800 bps. Complies with IEC 61162-1.




### *AIS transponder*

Baud rate is fixed at 38400 bps. Complies with IEC 61162-2.




**Absolute maximum rating**

Input

Forward current: 50mA

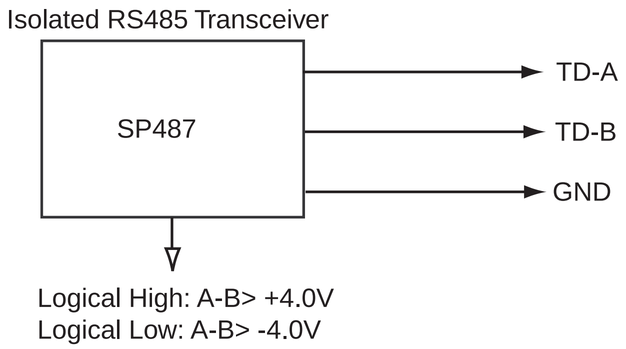
Reverse voltage: 3V

## LAN adapter: output port

AIS output port: Baud rate is fixed at 38400 bps. Complies with IEC 61162-2.

Other port: Baud rate is fixed at 4800 bps. Complies with IEC 61162-1.

### Output port (TD-A, TD-B)




### Absolute maximum rating

Output
Supply voltage: 7V
High level output voltage: 7V
Low level output current: 50mA

# Appendix 6: Parts Lists and Parts Location

## Parts Lists

### Radar

**Processor Unit RPU-016, Control Unit RCU-020/015, Monitor Unit MU-201CE/MU-231CE**

**FURUNO**

ELECTRICAL PARTS LIST

2010/11

| | |
|---|---|
| Model | FCR-2107(-BB,-D)/2807(-D) Series |
| Unit | Processor Unit RPU-016<br>Control Unit RCU-020<br>Control Unit RCU-015<br>Monitor Unit MU-201CE<br>Monitor Unit MU-231CE |

| SYMBOL | PRINTED CIRCUIT BOARD/ ASSY. TYPE | REMARKS |
|---|---|---|
| **PROCESSOR UNIT RPU-016** | | |
| PTU Board | 03P9339 | AC spec. |
| | 03P9338 | DC spec. |
| SPU Board | 03P9337 | |
| HV Board | HV9017 | |
| Terminal Board | 03P9342 | |
| NET Board | 03P9332 | |
| **CONTROL UNIT RCU-020** | | |
| PNL Board | 03P9343 | |
| BUZ Board | 03P9362 | |
| Trackball Assy. | TA4726N | |
| **CONTROL UNIT RCU-015** | | |
| PNL Board | 03P9344 | |
| Trackball Assy. | TA4726N | |
| **MONITOR UNIT MU-201CE** | | |
| Noise Filter | 5220.0123.1 | |
| Power Supply | HYPERION OBL03 131 | |
| DVI I/F Board | FPI NO SW | |
| LCD Unit | NL128102AC31-02 | |
| Backlight Unit | 201LHS02 | |
| Inverter Board | AC1458□ | |
| Connector Board | AC1457 | |
| **MONITOR UNIT MU-231CE** | | |
| Noise Filter | 5220.0123.1 | |
| Power Supply | HYPERION OBL03 131 | |
| DVI I/F Board | FPI NO SW | |
| LCD Unit | FLC59UXC8V-04 | |
| Backlight Unit | FLCL-23 | |
| Inverter Board | AC-1366□ | |
| FAN | F62LM-012K-0 | |
| FAN Drive Board | FAN CONTROLLER | |

**Monitor Unit MU-231**

## ELECTRICAL PARTS

| Model | FCR-2807-D |
|---|---|
| Unit | Monitor Unit MU-231 |

| **PRINTED CIRCUIT BOARD** | **Code No.** |
|---|---|
| OZP-120-12/15-J06 | - |
| 26P0023 (PSW board) | - |
| ESSIP33A-1C (AD board) | - |
| 26P0013 | - |
| **LCD** | **Code No.** |
| LQ231U1LW32, 26S0062 | - |
| **FAN** | **Code No.** |
| MFB52A-12HA-001, 26S0028 (FAN1) | - |
| 109P0612H755, 26S0063 (FAN2/FAN3) | - |

**Monitor Unit MU-190**

## ELECTRICAL PARTS

| Model | FCR-2107-D |
|---|---|
| Unit | Monitor Unit MU-190 |

| **PRINTED CIRCUIT BOARD** | **Code No.** |
|---|---|
| OZP-120-12/15-J06 | - |
| 26P0023 (PSW board) | - |
| ESSIP33A-1C (AD board) | - |
| 26P0013 | - |
| **LCD** | **Code No.** |
| LQ190E1LX51, 26S0027 | - |
| **FAN** | **Code No.** |
| MFB52A-12HA-001, 26S0028 (FAN1) | - |
| LQ0DDB0094, 26S0048 (FAN4) | - |

## Antenna Unit RSB-096/097 (for FCR-2117(-BB,-D)/2127(-BB,-D)/2817(-D)/2827(-D))

**FURUNO**

| | |
|---|---|
| Model | FCR-2117(-BB,-D)/2127(-BB,-D)/2817(-D)/2827(-D) |
| Unit | Antenna Unit RSB-096/097 |
| | |
| | |
| | |

**ELECTRICAL PARTS LIST**

2010/11

| SYMBOL | NAME | REMARKS |
|---|---|---|
| | **PRINTED CIRCUIT BOARD** | |
| RF | 03P9349 | |
| BP | 03P9347 | |
| MD | 03P9244-A | FCR-2117(-BB,-D)/2817(-D) |
| | 03P9244-B | FCR-2127(-BB,-D)/2827(-D) |
| | **SCANNER CHASSIS** | |
| | RSB-096 | 24 rpm |
| | RSB-097 | 42 rpm |
| | **RF MODULE** | |
| | RTR-078 | FCR-2117(-BB,-D)/2817(-D) |
| | RTR-079 | FCR-2127(-BB,-D)/2827(-D) |
| | **MIC ASSEMBLY** | |
| | RU-9601 | FCR-2117(-BB,-D)/2817(-D) |
| | RU-9603 | FCR-2127(-BB,-D)/2827(-D) |
| | **MOTOR** | |
| | D8G-516 | 24 rpm, w/capacitor |
| | D8G-571 | 42 rpm, w/capacitor |
| | **DIODE LIMITER** | |
| | RU-9099 | FCR-2117(-BB,-D)/2127(-BB,-D)/2817(-D)/2827(-D) |
| | **CIRCULATOR** | |
| | RC-3686 | FCR-2117(-BB,-D)/2127(-BB,-D)/2817(-D)/2827(-D) |
| | **PULSE TRANSFORMER** | |
| | RT-9023 | FCR-2117(-BB,-D)/2817(-D) |
| | RT-9025 | FCR-2127(-BB,-D)/2827(-D) |
| | **MAGNETRON** | |
| | MG4010 or MAF1425B | FCR-2117(-BB,-D)/2817(-D) |
| | MG5436 | FCR-2127(-BB,-D)/2827(-D) |

**Antenna Unit RSB-103/104/105 (FCR-2827W(-D))**

# FURUNO

| | |
|---|---|
| Model | FCR-2827W(-D) |
| Unit | Antenna Unit RSB-104/105 |

**ELECTRICAL PARTS LIST**

2010/11

| SYMBOL | NAME | REMARKS |
|---|---|---|
| | **PRINTED CIRCUIT BOARD** | |
| TB | 03P9349 | |
| BP GEN | 03P9347 | |
| | **MOTOR** | |
| | D8G-516 | |

**Transceiver Unit RTR-081 (FCR-2827W(-D))**

# FURUNO

| | |
|---|---|
| Model | FCR-2827W(-D) |
| Unit | Transceiver Unit RTR-081 |

**ELECTRICAL PARTS LIST**

2010/11

| SYMBOL | NAME | REMARKS |
|---|---|---|
| | **PRINTED CIRCUIT BOARD** | |
| TB | 03P9349 | |
| IF AMP | 03P9335 | |
| PWR | 03P9348 | |
| MD | 03P9244 | |
| RFC | 03P9346 | |
| | **MIC ASSEMBLY** | |
| | RU-9601 | |
| | **MOTOR** | |
| | 109P0824H602 | 24 rpm |
| | **DIODE LIMITER** | |
| | RU-9099 | |
| | **CIRCULATOR** | |
| | RC-3686 | |
| | **PULSE TRANSFORMER** | |
| | RT-9023 | |
| | **ISOLATOR** | |
| | FX0157 | |
| | **MAGNETRON** | |
| | MG5436 | |

## Antenna Unit RSB-098/099/100/101/102 (for FCR-2137S-BB,-D)/2837S(-D))

# FURUNO

| | | |
|---|---|---|
| Model | FCR-2137S(-BB,-D), FCR-2837S(-D) | |
| Unit | Antenna Unit | RSB-098/099 |
| | | RSB-100/101/102 |

### ELECTRICAL PARTS LIST

2010/11

| SYMBOL | NAME | | REMARKS |
|---|---|---|---|
| | **PRINTED CIRCUIT BOARD** | | |
| TB | 03P9349 | | |
| IF AMP | 03P9335 | | |
| PWR | 03P9348 | | |
| MD | 03P9244 | | |
| RFC | 03P9346 | | |
| MSS | MSS-7497 | | 200/220V, 3ϕ |
| MSS | MSS-7497A | | 380/440V, 3ϕ |
| | **SCANNER CHASSIS** | | |
| | RSB-098 | | 21/26 rpm |
| | RSB-099 | | 21/26 rpm |
| | RSB-100 | | 45 rpm |
| | RSB-101 | | 45 rpm |
| | RSB-102 | | 45 rpm |
| | **RF MODULE** | | |
| | RTR-080 | | |
| | **MIC ASSEMBLY** | | |
| | RU-9760A | | |
| | **MOTOR** | | |
| | RM-7398 | RSB-098/099 | 21/26 rpm, 200/220V, 3ϕ |
| | RM-7435 | RSB-098/099 | 21/26 rpm, 380/440V, 3ϕ |
| | RM-9519 | RSB-100/101/102 | 45 rpm, 220V, 3ϕ, 50 Hz |
| | RM-9520 | RSB-100/101/102 | 45 rpm, 220V, 3ϕ, 60 Hz |
| | RM-9521 | RSB-100/101/102 | 45 rpm, 440V, 3ϕ, 60 Hz |
| | **DIODE LIMITER** | | |
| | RU-9426 | | |
| | **CIRCULATOR** | | |
| | RC_6584S | | |
| | **PULSE TRANSFORMER** | | |
| | RT-9273 | | |
| | **MAGNETRON** | | |
| | MG5223F | | |

**Antenna Unit RSB-104/105 (for FCR-2837SW(-D))**

**FURUNO**

| | |
|---|---|
| Model | FCR-2837SW(-D) |
| Unit | Antenna Unit RSB-104/105 |

**ELECTRICAL PARTS LIST**

2010/11

| SYMBOL | NAME | | REMARKS |
|---|---|---|---|
| | **PRINTED CIRCUIT BOARD** | | |
| TB | 03P9349 | | |
| BP GEN | 03P9347 | | |
| MSS | MSS-7497 | | 200/220V, 3ϕ |
| | MSS-7497-A | | 380/440V, 3ϕ |
| | **MOTOR** | | |
| | RM-7398 | RSB-104 | 21 rpm: 200 V, 3ϕ, 50 Hz |
| | | RSB-104 | 26 rpm: 220 V, 3ϕ, 60 Hz |
| | RM-7345 | RSB-105 | 21 rpm: 380 V, 3ϕ, 50 Hz |
| | | RSB-105 | 26 rpm: 440 V, 3ϕ, 60 Hz |

**Power Supply Unit PSU-007 (for FCR-2137S(-BB,-D)/2837S(-D))**

**FURUNO**

| | |
|---|---|
| Model | PSU-007 |
| Unit | Power Supply Unit |

**ELECTRICAL PARTS LIST**

2010/11

| SYMBOL | NAME | REMARKS |
|---|---|---|
| | **PRINTED CIRCUIT BOARD** | |
| TB1 | | |
| | **RELAY** | |
| | HG3_DC12V | |

**Transceiver Unit RTR-082 (for FCR-2837SW(-D)**

# FURUNO

| | |
|---|---|
| Model | FCR-2837SW(-D) |
| Unit | Transceiver Unit RTR-082 |
| | |
| | |
| | |

## ELECTRICAL PARTS LIST

2010/11

| SYMBOL | NAME | REMARKS |
|---|---|---|
| | **PRINTED CIRCUIT BOARD** | |
| TB | 03P9349 | |
| IF AMP | 03P9335 | |
| PWR | 03P9348 | |
| MD | 03P9244 | |
| RFC | 03P9346 | |
| | **MIC ASSEMBLY** | |
| | RU-9760A | |
| | **MOTOR** | |
| | 109P0824H602 | |
| | **TR LIMITER** | |
| | TL378A | |
| | **CIRCULATOR** | |
| | RC_6584S or RC4910S | |
| | **PULSE TRANSFORMER** | |
| | RT-9273 | |
| | **MAGNETRON** | |
| | MG5223F | |

## Chart Processor Unit EC-1000C

**FURUNO**

| | |
|---|---|
| Model | FCR-2107(-BB,-D)/FCR-2807(-D) |
| Unit | Chart Processor Unit EC-1000C |
| Ref.Dwg. | |
| Blk.No. | |

**ELECTRICAL PARTS LIST**

2010/11

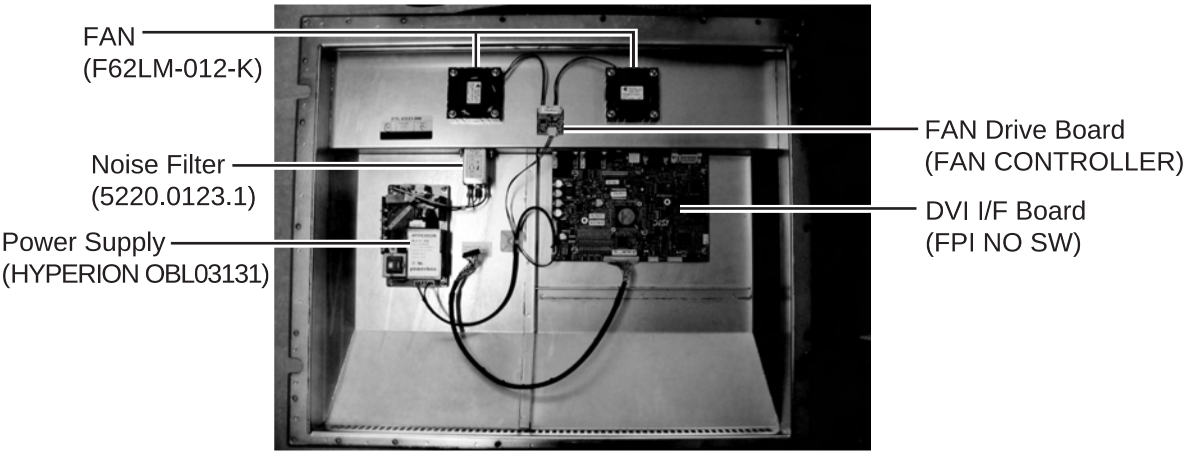
| SYMBOL | PRINTED CIRCUIT BOARD/ ASSY. TYPE | CODE NO. | REMARKS |
|---|---|---|---|
| **CHART PROCESSOR UNIT EC-1000C** | | | |
| EMC Filter | FN 2080-6/06 | | |
| DVD-ROM Drive | GDR-H30N | | |
| Floppy Disc Drive | FD-235HF | | |
| Hard Disk | MHW2040AC | | |
| SDRAM DIMM Board* | 77.G1136.44G | | |
| | ME1GU72CD2P | | |
| BACKPLANE Board | PCI-5S-RS-R40 | | |
| Power Supply | UPF250-AA-BG | | |
| CPU Board Assy.* | PCG-820GV | | |
| | 24P0100 | | |
| PWR ON Board | 24P0092 | | |
| Processor Cooler Assy.* | 2806KL-04W-B69-B50 | | |
| | ASYG-FAN-FU-HEATSINK | | |
| Chassis Fan | AD0812LB-A73GL | | |

* Type depends on unit production date.

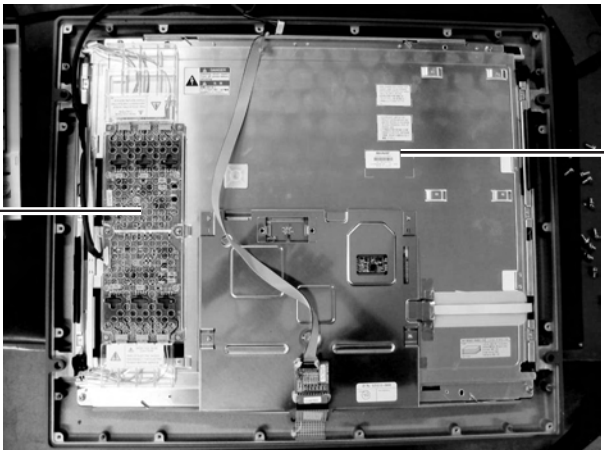
# Parts Location

## Radar

**Display Unit MU-231CE**

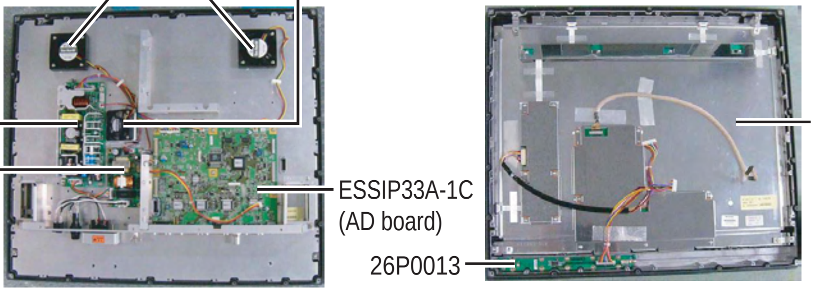



*Display unit MU-231CE, inside rear cover*



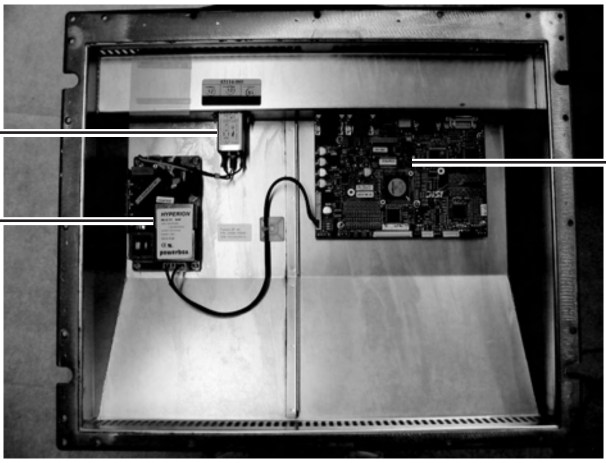

*Monitor unit MU-231CE, rear cover removed*

**Monitor Unit MU-231**

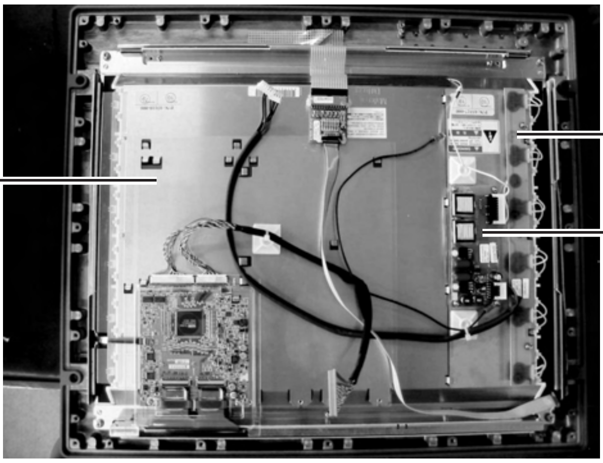



*Monitor unit MU-231*

**Monitor Unit MU-201CE**

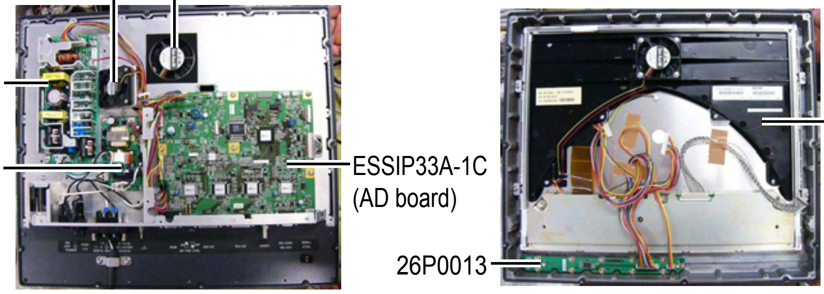



*Display unit MU-201CE, inside rear cover*



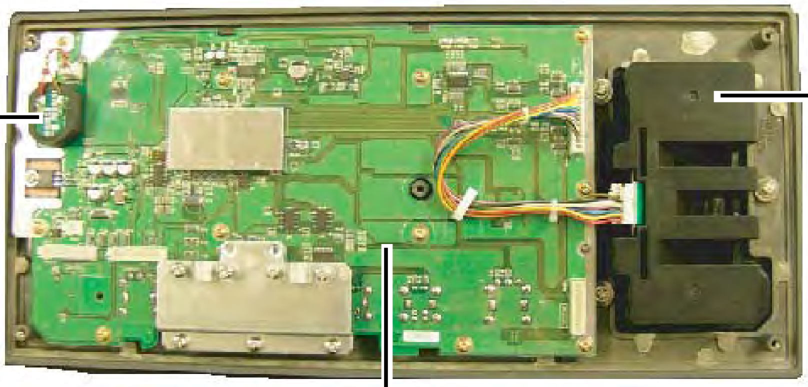

*Monitor unit MU-201CE, rear cover removed*

**Monitor Unit MU-190**



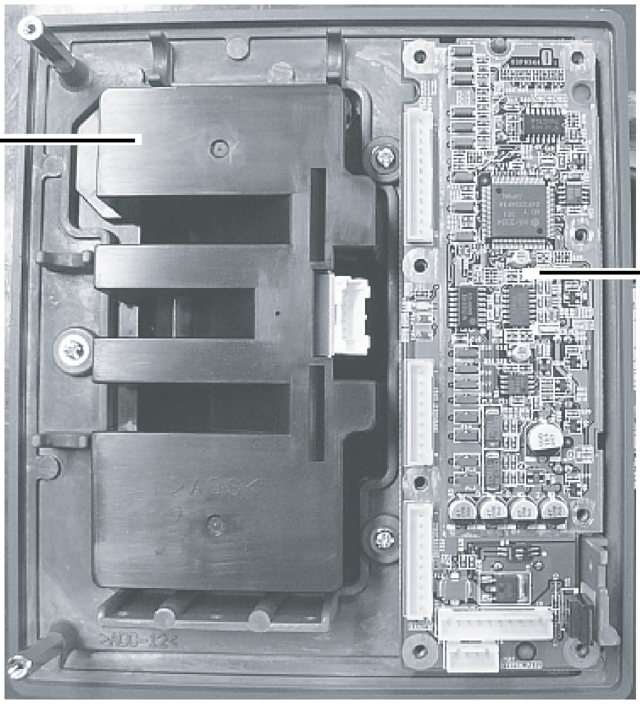

*Monitor unit MU-190*

**Control Unit RCU-020**



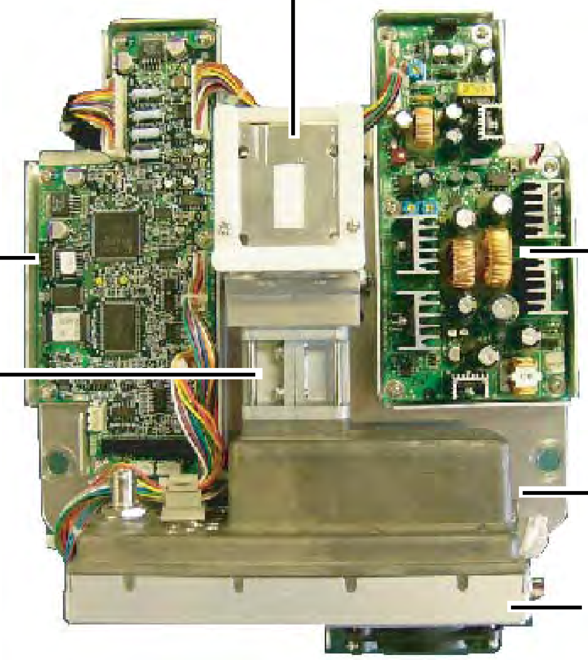

*Control unit RCU-020, rear cover removed*

**Control Unit RCU-015**

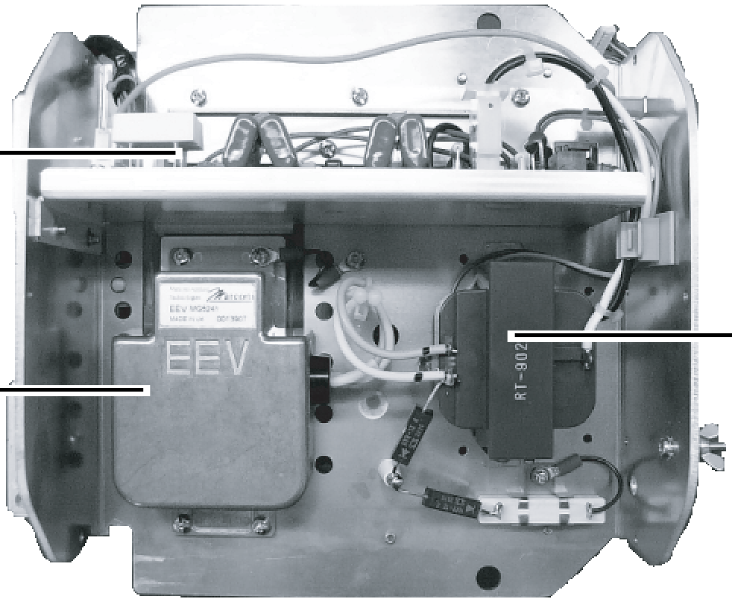



*Control unit RCU-015, rear cover removed*

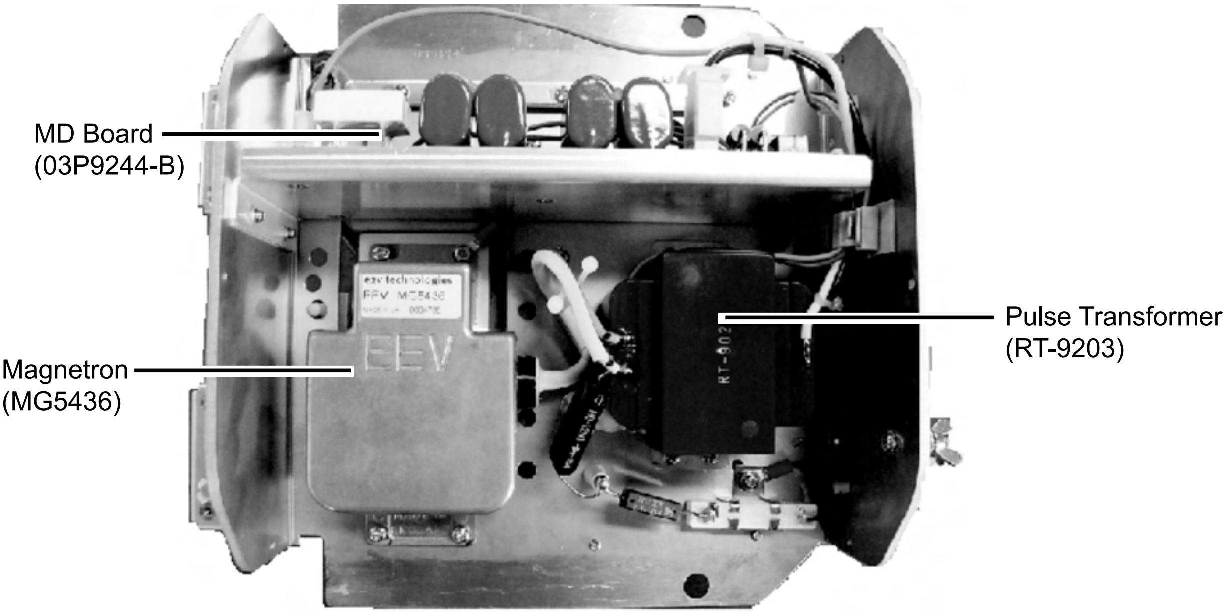
**Transceiver Unit RTR-078/079 (for FCR-2117(-BB,-D)/2127(-BB,-D)/2817/2827(-D))**




*Transceiver unit RTR-078/079, upper half*

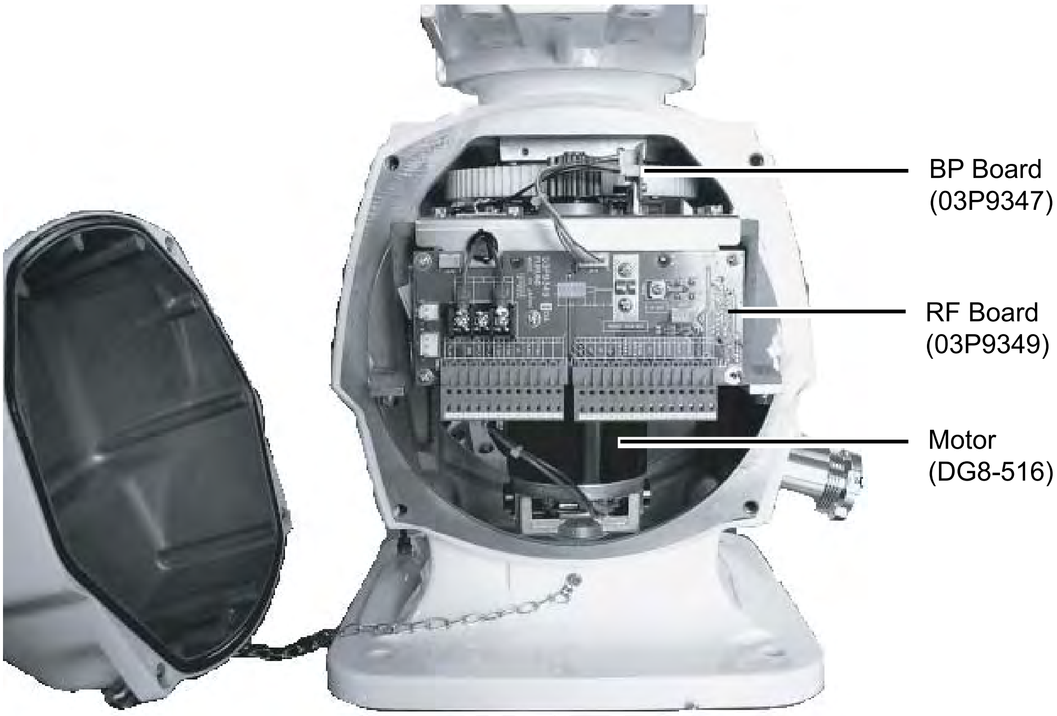



*Transceiver unit RTR-078, lower half*



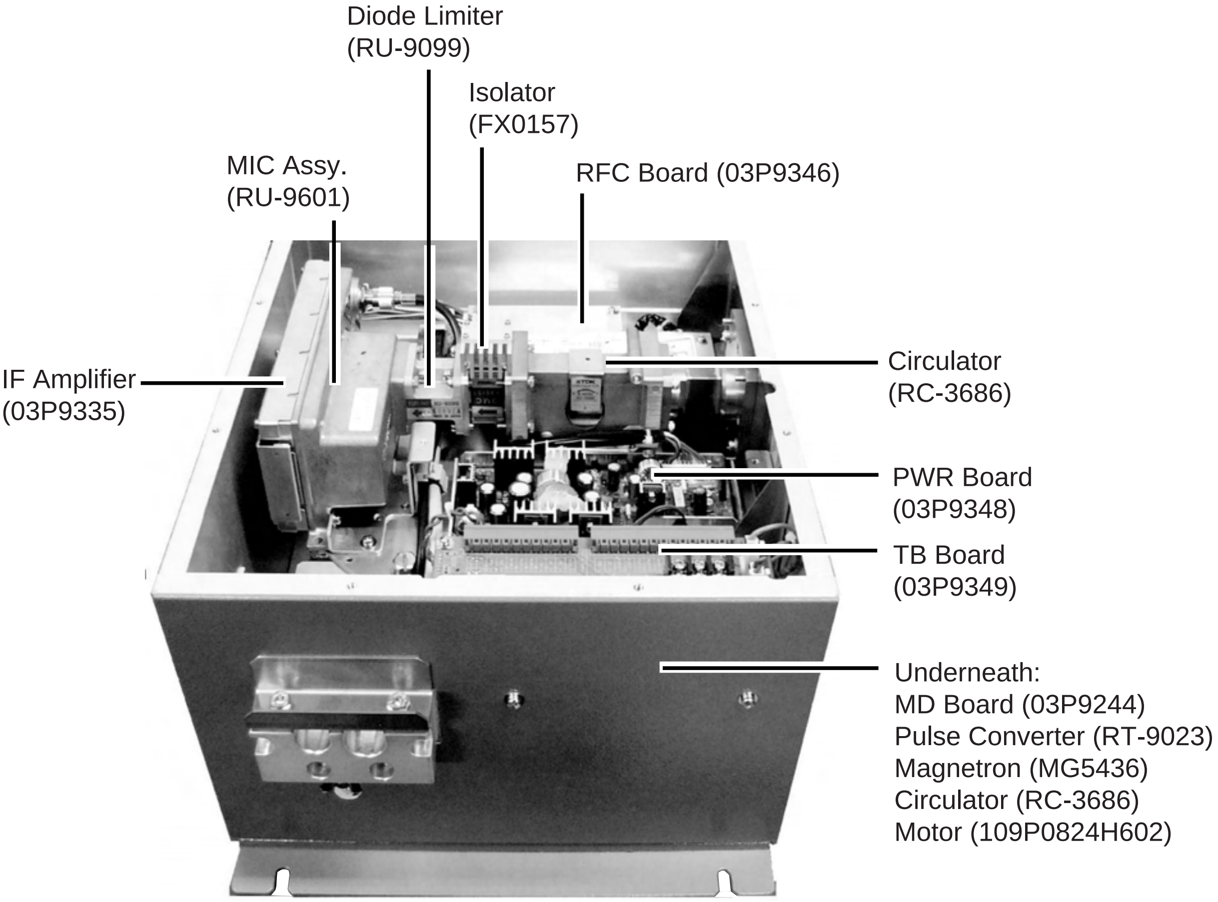

*Transceiver unit RTR-079, lower half*

**Antenna Unit RSB-103 (for FCR-2827W(-D))**



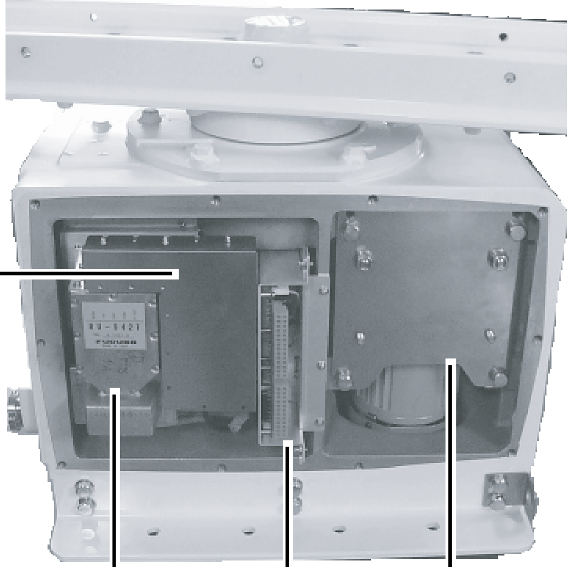

*Antenna unit RSB-103*

**<u>Transceiver Unit RTR-081 (for FCR-2827W(-D))</u>**

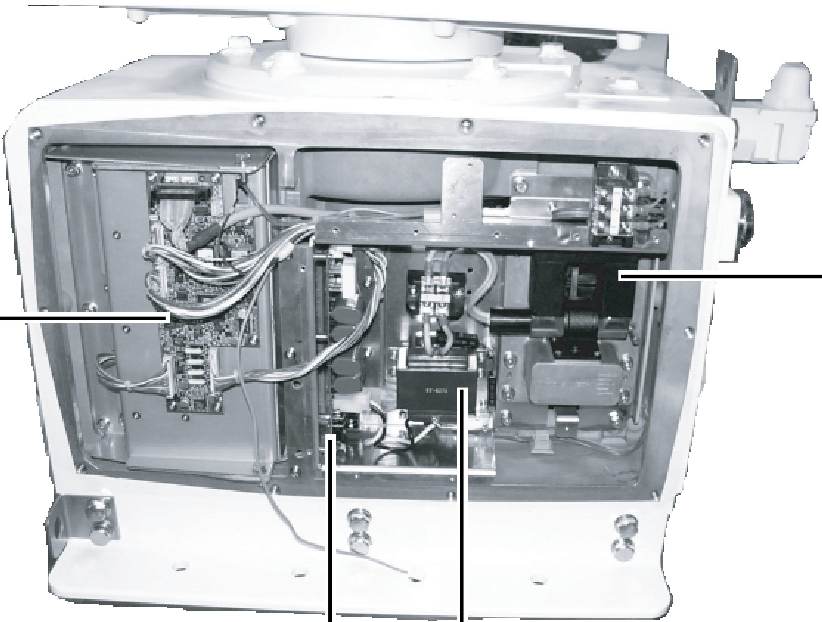



*Transceiver unit RTR-081, cover opened*

**Antenna Unit RSB-098/099/100/101/102 (for FCR-2137S(-BB,-D)/2837S(-D))**

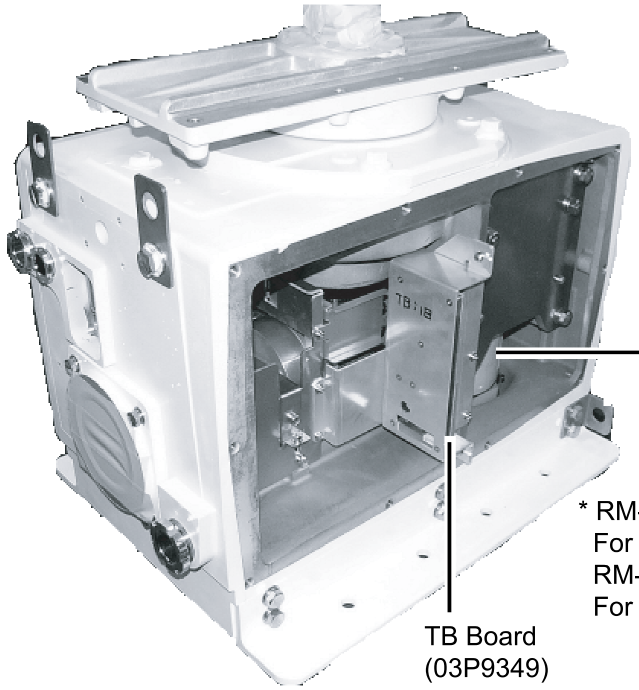



*Antenna unit RSB-098/099/100/101/102, cover opened*

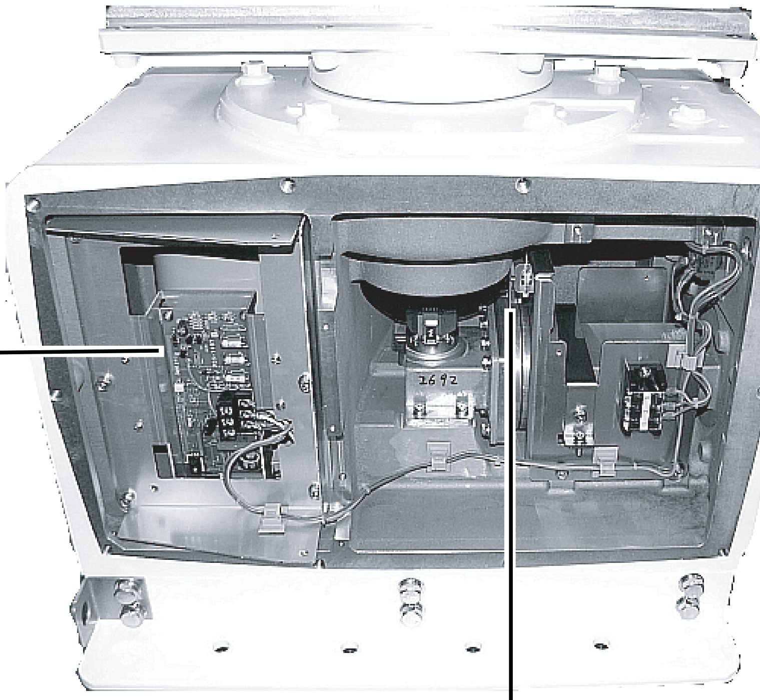



*Antenna unit RSB-098/099/100/101/102, cover opened*

**Antenna Unit RSB-104/105 (for FCR-2837SW(-D))**

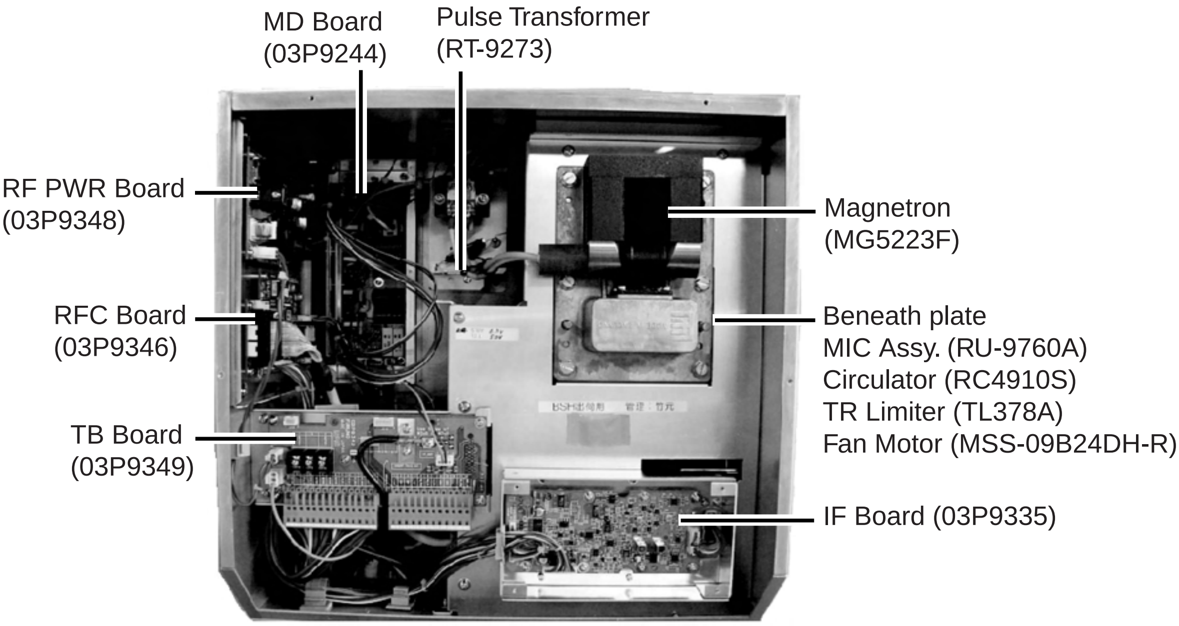



*Antenna unit RSB-104/105, cover opened*



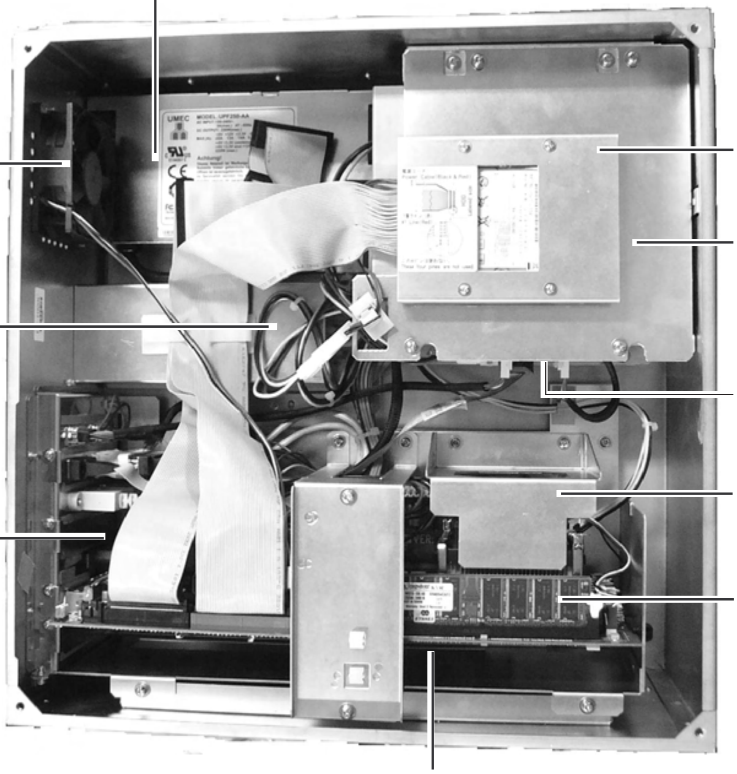

*Antenna unit RSB-104/105), cover opened*

**Transceiver Unit RTR-082 (for FCR-2837SW(-D))**




*Transceiver unit RTR-082, cover opened*

## Chart Processor Unit EC-1000C




*Processor unit EC-1000C, cover opened*

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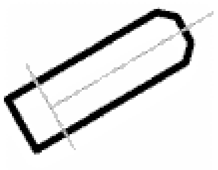
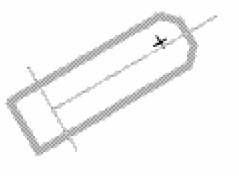
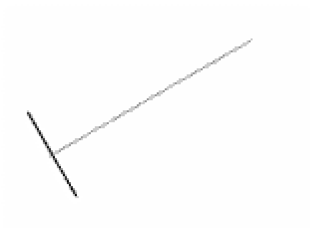
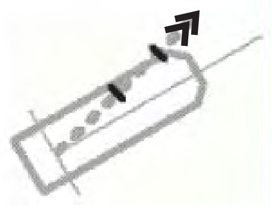
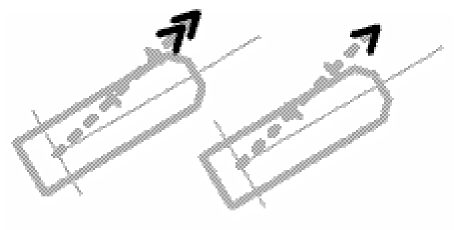
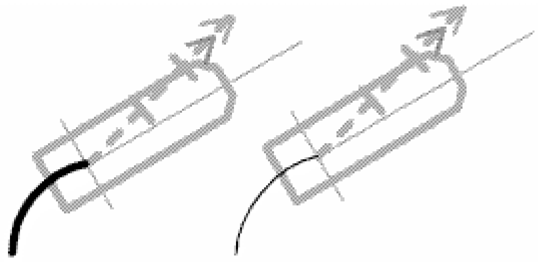
# Appendix 7: Abbreviations, Symbols

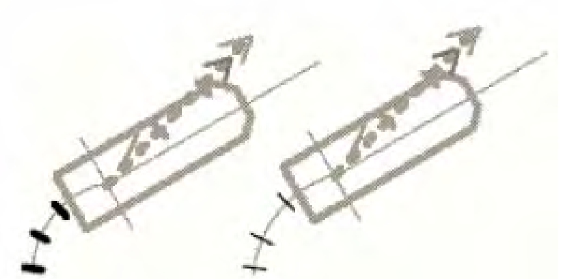
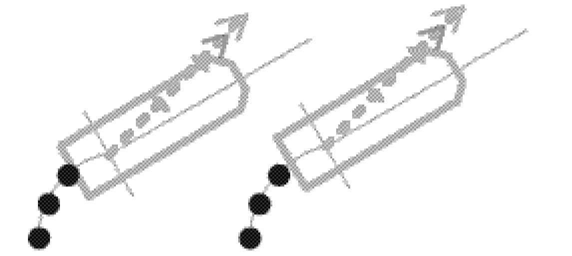
## Abbreviations

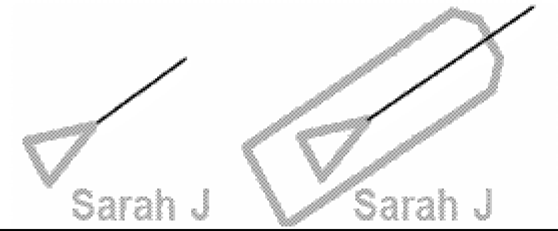
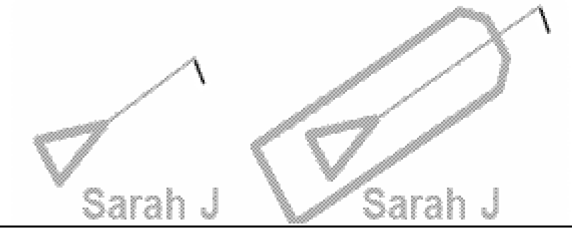
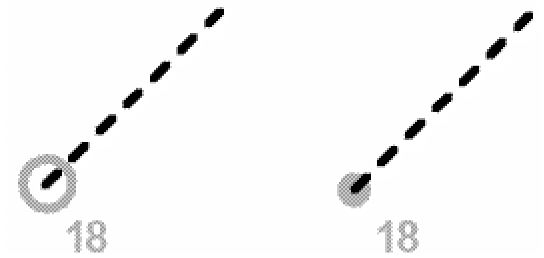
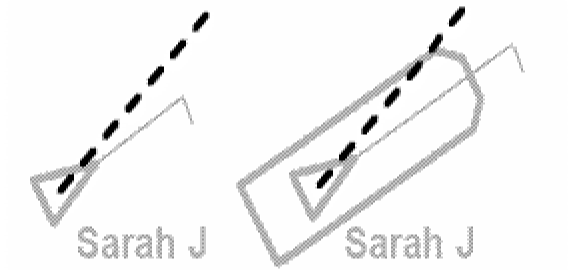
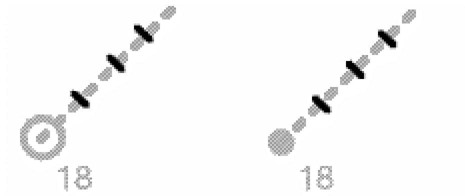
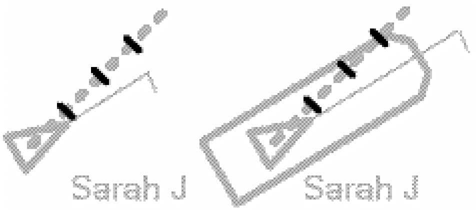
| Word | Abbreviation | Word | Abbreviation |
|---|---|---|---|
| Acknowledge | ACK | Maximum | MAX |
| Acquire | ACQ | Medium Frequency Direction Finder | MFDF |
| Activate | Act | Minimum | MIN |
| Automatic Identification System | AIS | minute(s) | min |
| Antenna | ANT | Maritime Mobile Services Identity Number | MMSI |
| Autopilot | AP | Man Overboard | MOB |
| Aids to Navigation | ATON | Messages | Msgs |
| Automatic | AUTO | North | N |
| Available | AVAIL | Navigation | NAV |
| Acquisition zone | AZ | Not Less Than | NLT |
| Bow Crossing Range | BCR | Nautical Mile(s) | NM |
| Bow Crossing Time | BCT | Not More Than | NMT |
| Bearing | BRG | Not Under Command | NUC |
| Brilliance | BRILL | Own Ship | OS |
| Bottom Tracking | BT | Parameters | Params |
| Calculated | CALC | Past Positions | PAST POSN |
| Calibrate | CALIB | Parallel Index Line | PI |
| Consistent Common Reference Point | CCRP | Performance Monitor | PM |
| Consistent Common Reference System | CCRS | Position | POSN |
| Compact Disc Read Only Memory | CDROM | Relative | R |
| Channel | Ch | Radius | RAD |
| Change | CHG | Anti Clutter Rain | RAIN |
| Course Over the Ground | COG | Reference / Echo reference | REF |
| Continue | CONT | Rejection | Rej |
| Corrected / Correction | CORR | Relative | REL |
| Closest Point of Approach | CPA | Regional ENC Co-ordinating Centre | RENC |
| Central Processing Unit | CPU | Rhumb Line | RL |
| Course | CRS | Relative Motion | RM |
| Course Through the Water | CTW | Range | RNG |
| degree(s) | deg | Rate Of Turn | ROT |
| Destination | DEST | Reference Target | RTGT |
| Differential GPS | DGPS | Receive | RX |
| Differential | Diff | South | S |
| Display | DISP | IHO Special publication 57 | S57 |
| Distance | DIST | Search And Rescue | SAR |
| Dialog | Dlg | Search And Rescue Transponder | SART |

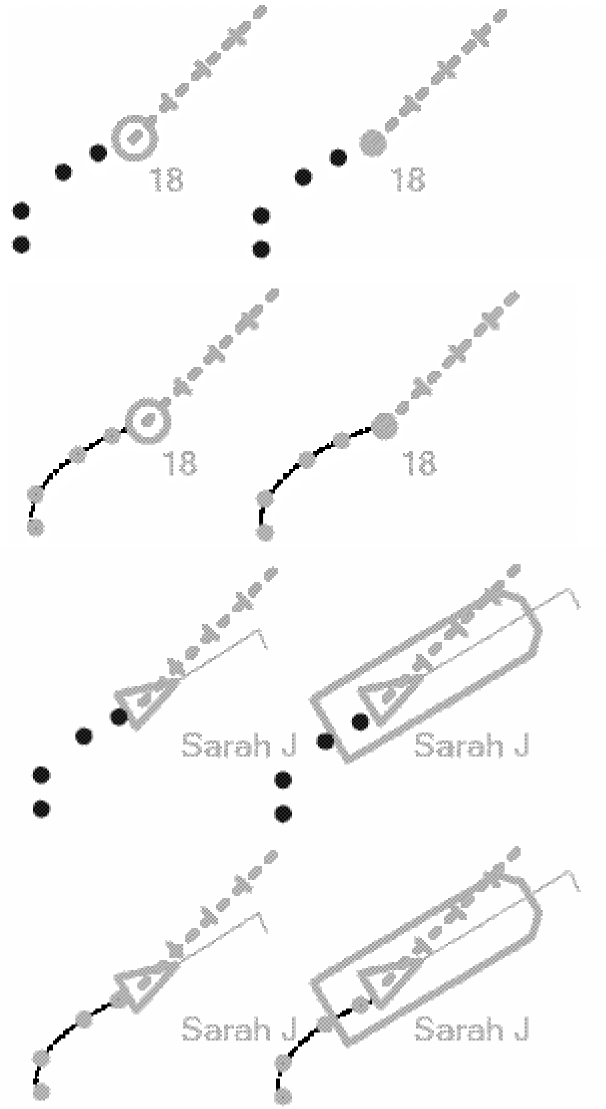
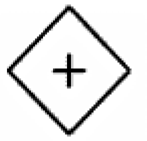
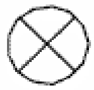
| | | | |
|---|---|---|---|
| Dead Reckoning | DR | Transversal Speed | SB |
| East | E | Anti Clutter Sea | SEA |
| Echo Average | EAV | second(s) | sec |
| Electronic Bearing Line | EBL | Select | sel |
| Electronic Chart Display and Information System | ECDIS | System ENC | SENC |
| Electronic Navigational Chart | ENC | Speed Over the Ground | SOG |
| Estimated Position | EP | Speed | SPD |
| Equipment | EQUIP | Stabilized | STAB |
| Error | ERR | Starboard | STBD |
| Echo Stretch | ES | Standby | STBY |
| Estimated Time of Arrival | ETA | Sensitivity time control | STC |
| Estimated Time Of Departure | ETD | Standard | Std |
| External | EXT | Speed Through the Water | STW |
| Filter / Filtered | FILT | Switch | SW |
| Function | Func | Symbol(s) | Symb |
| Great Circle | GC | True | T |
| Ground | GND | Time to CPA | TCPA |
| Global Positioning System | GPS | Target | TGT |
| Heading | HDG | True Motion | TM |
| Heading Line | HL | Transferred Line Of Position | TPL |
| High Speed Craft | HSC | Target Tracking / Tracked Target | TT |
| Integrated Bridge System | IBS | Time To Go | TTG |
| Identification | ID | Transmit | TX |
| International Maritime Organization | IMO | Uncalibrated | UNCAL |
| Information | INFO | Coordinated Universal Time | UTC |
| Integrated Navigation System | INS | Vector | VECT |
| Interference Rejection | IR | Variable Range Marker | VRM |
| Latitude / Longitude | L/L | West | W |
| Latitude | LAT | Water | WAT |
| Limit | LIM | World Geodetic System | WGS |
| Longitude | LON | Wheel Over Point | WOP |
| Line Of Position | LOP | Waypoint | WPT |
| Magnetic | MAG | Water Tracking | WT |
| Manual | MAN | | |

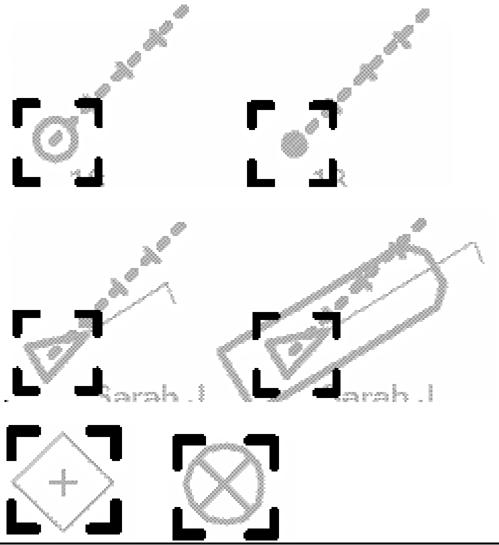
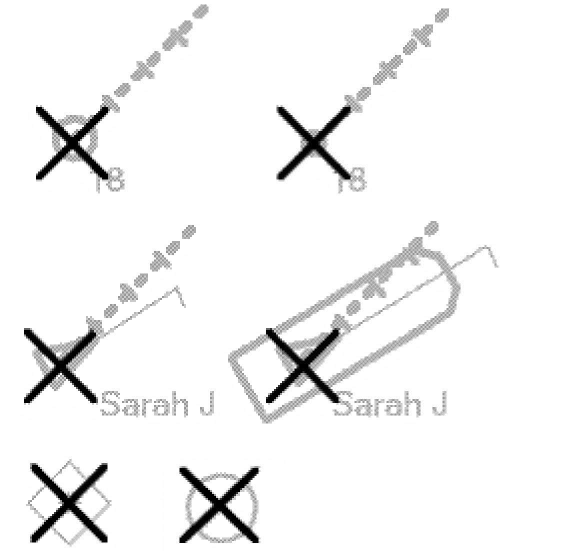
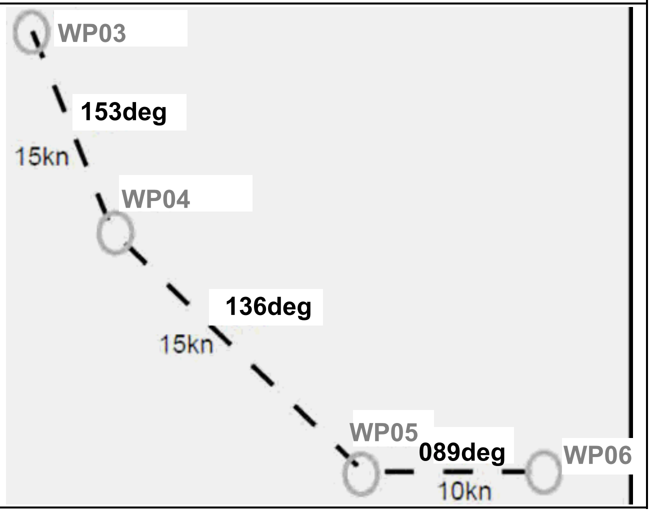
# Symbols

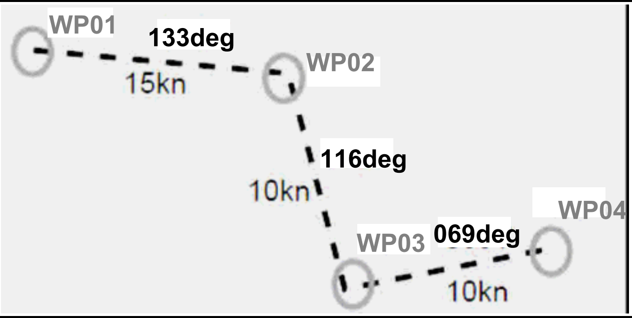
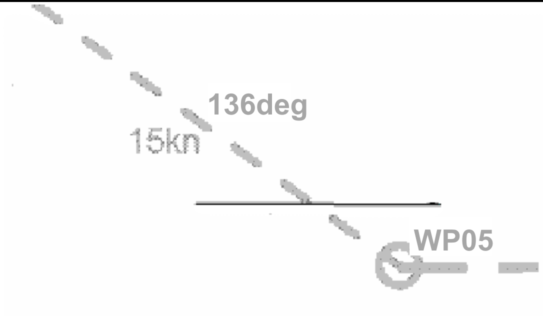
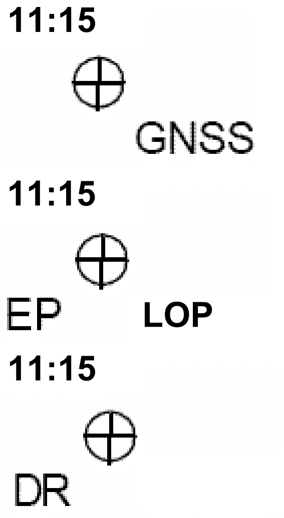
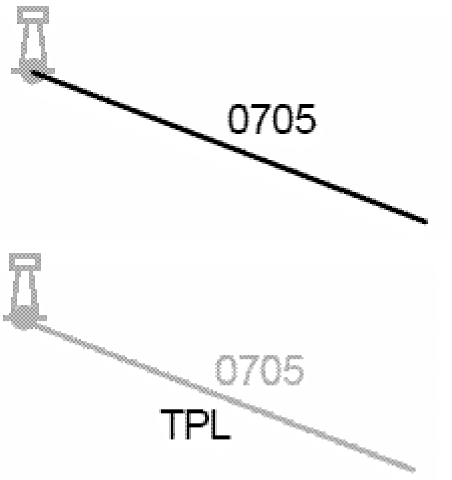
| Symbol name and description | Symbol graphic(s) |
|---|---|
| **Own ship – true scaled outline**<br>This can be displayed when based on user selection either beam width or length is more than 6 mm |  |
| **Radar antenna position**<br>This symbol indicates location of the radar antenna.<br>Select if position of radar antenna is displayed with symbol X by Symbol Display dialog. |  |
| **Heading line**<br>This line originates from CCRP or Radar antenna position.<br>CCRP: Consistent Common Reference Point | |
| **Beam line**<br>This line passed through the CCRP or Radar antenna position. |  |
| **Velocity vector – time increments** |  |
| **Velocity vector – stabilisation indicator**<br>Ground stabilisation is indicated by double arrowhead and water stabilisation is indicated as single arrowhead. |  |
| **Past track**<br>System past track is indicated by thick line. Raw sensor primary past track is indicated by thin line. Raw sensor secondary past track is indicated by grey thin line. |  |

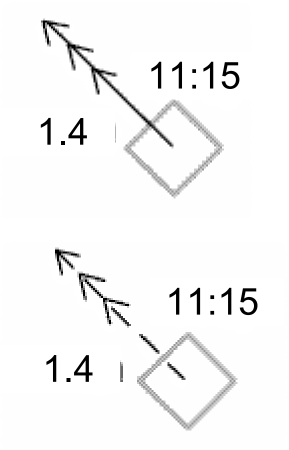
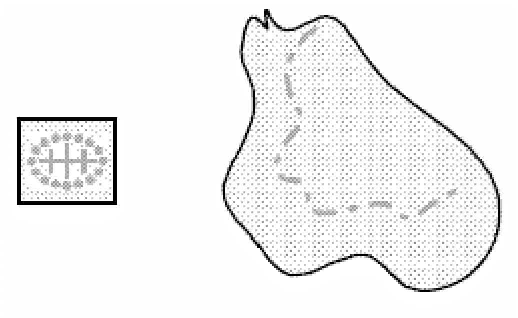
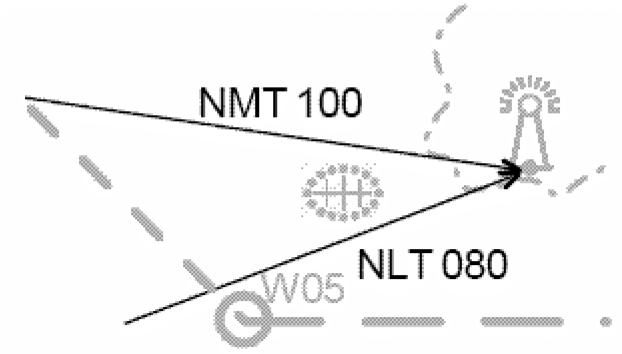
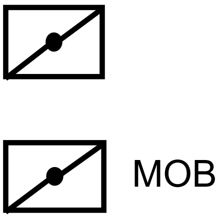
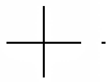
| | |
|---|---|
| **Past track – time increments**<br>Time increments are presented as single lines perpendicular to the past track. |  |
| **Past track – past positions**<br>Past positions are drawn as small filled circular symbols. |  |
| **Radar targets in acquisition state** | 5 mm in diameter |
| **Tracked radar targets**<br>TT: Std or small user selection by Symbol Display | 3 mm in diameter |
| **Tracked radar targets – alternative**<br>TT: Std or small user selection by Symbol Display | 2 mm in diameter |
| **Tracked radar targets – dangerous target**<br>Dangerous target symbol is red and it flash until acknowledged | 5 mm in diameter |
| **Sleeping AIS targets**<br>Orientation is towards heading (or COG if heading unknown).<br><br>If both heading and COG are unknown the orientation is toward top of display | <br> |
| **Activated AIS targets**<br>Orientation is towards heading (or COG if heading unknown).<br><br>If both heading and COG are unknown the orientation is toward top of display | <br> |
| **Activated AIS targets – true scaled outline**<br>- This can be displayed when based on user selection either beam width or length is more than 7.5 mm<br>- AIS outline: ON/OFF | |

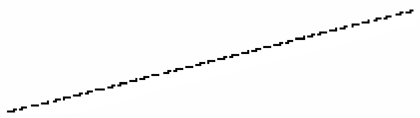
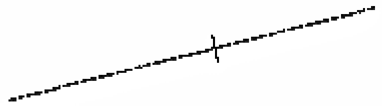
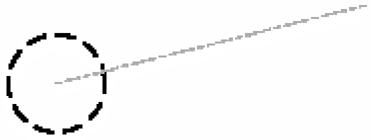
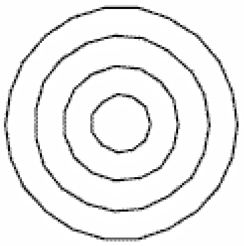
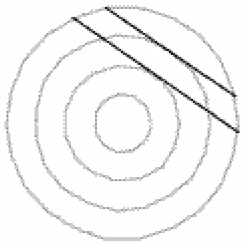
| | |
|---|---|
| **Activated AIS targets – dangerous targets**<br>Dangerous target symbol is red and it flash until acknowledged | |
| **Activated AIS targets – heading lines** |  |
| **Activated AIS targets – heading lines** – turn indicators |  |
| **Velocity vectors**<br><br>- Radar target<br><br>- AIS target | <br> |
| **Velocity vectors – time increments**<br><br>- Radar target<br><br>- AIS target | <br> |

| | |
|---|---|
| **Velocity vectors – path predictor** | |
| **Target past positions** |  |
| **AIS aid to navigation (ATON)**<br>Real ATON is without "V" and virtual ATON is with "V"<br>An ATON in off position is red | <br> |
| **AIS search and rescue transmitter -SART** |  |

<table>
<tr><td>Selected targets</td><td></td></tr>
<tr><td>Lost targets<br>Lost target symbol is red and it flash until acknowledged</td><td>
</td></tr>
<tr><td>Waypoint</td><td>
</td></tr>
<tr><td>Next waypoint</td><td>
</td></tr>
<tr><td>Routes - Monitor<br>Monitored route leg lines are dashed<br>Leg lines may indicate planned speed and bearing</td><td>
</td></tr>
</table>

| | |
|---|---|
| **Routes - Planned**<br>Planned route leg lines are dotted<br>Leg lines may indicate planned speed and bearing. |  |
| **Wheel over position** |  |
| **Plotted positions**<br>Plotted position includes some labels. Type is DR, EP or Fix (Fix is without label).<br>Examples of source labels are<br>GNSS: G<br>GPS: G<br>DGPS: dG<br>Loran: L etc. |  |
| **Line of position**<br>Abbreviation is LOP. Label TPL is used to indicate measurement transferred by dead reckoning. |  |

| | |
|---|---|
| **Tidal stream**<br>User defined tidal stream symbols are available as part of UserChart. Actual tidal stream use solid vector and predicted tidal stream use dashed vector. | <br> |
| **Danger highlight**<br>Route Plan, Route Monitor and own ship Chart Alarm search area use danger highlight to indicate violation against user selected dangers. |  |
| **Danger bearing**<br>Also called by traditional name clearing line.<br>User defined clearing line symbols are available as part of UserChart. | <br> |
| **Event marker**<br>Event markers indicate events recorded into the Voyage record. Man over board event has label MOB. | <br> |
| **User cursor** |  |

| | |
|---|---|
| **Electronic bearing line (EBL)**<br>Second example show with range marker. | <br> |
| **Variable range marker (VRM)** |  |
| **Range rings** |  |
| **Parallel index lines** |  |

# SPECIFICATIONS OF MARINE RADAR/ARPA FCR-2117(-BB,-D)/2127(-BB,-D)/2817(-D)/2827(-D)/ 2137S(-BB,-D)/2827W(-D)/2837S(-D)/2837SW(-D)

## 1. GENERAL

1.1 Model

| Model | Frequency Band | Display | Output Power | Transceiver location | Radiator |
|---|---|---|---|---|---|
| FCR-2117(-D) | X-band | 19" (FCR-21x7-D) 20.1" | 12 kW | In antenna unit | 204 cm, 255 cm |
| FCR-2127(-D) | | | 25 kW | | |
| FCR-2817(-D) | | 23.1" | 12 kW | | |
| FCR-2827(-D) | | | 25 kW | | |
| FCR-2117-BB | | User supply | 10 kW | | |
| FCR-2127-BB | | | 25 kW | | |
| FCR-2827W(-D) | | 23.1" | 25 kW | TR unit | |
| FCR-2137S(-D) | S-band | 19" (FCR-21x7-D) 20.1" | 30 kW | In antenna unit | 309 cm, 377 cm |
| FCR-2837S(-D) | | 23.1" | | | |
| FCR-2837SW(-D) | | | | TR unit | |
| FCR-2137S-BB | | User supply | | In antenna unit | |

1.2 Display Unit

Display: Raster scan, daylight bright, single or multicolor (32)

Scan system: Interlace (horizontal, 48.3 kHz, vertical 60 Hz)

Picture

| | FCR-21x7(-D) series | FCR-28x7(-D) series |
|---|---|---|
| Size | 19-inch(FCR-21x7-D) or 20.1-inch LCD | 23.1-inch LCD |
| Display range | 408×306 | 470.4×352.8 |
| Resolution | 1280×1024 pixel | 1600×1200 pixel |
| Effective display area | 250 mm | 340 mm |

Display mode: Radar mode, chart radar mode, ECDIS mode

Presentation mode: Head-up, Heading-up TB, Course-up, Course-up true, North-up, North-up true

## 2. RADAR/CHART RADAR

2.1 Antennna unit

Type: Slotted waveguide arrayAntenna Radiators

Polarization: Horizontal

Wind resistance: Relative wind 100 kt

Beam width and sidelobe attenuation

| | X-band | | S-band | |
|---|---|---|---|---|
| | XN20AF | XN24AF | SN30AF | SN36AF |
| Length | 204 cm | 255 cm | 309 cm | 377 cm |
| Beam width(H) | 1.23° | 0.95° | 2.3° | 1.8° |
| Beam width(V) | 20° | | 25° | |
| Sidelobe within ±10° | -28db | | -24 db | |
| Sidelobe outside ±10° | -32 db | | -30 db | |

Rotation FCR-2117(-BB,-D)/2127(-BB,-D)/2817(-D)/2827(-D): 24 rpm or 42 rpm
FCR-2137S(-D)/2837S(-D): 21 rpm (50 Hz)/26 rpm (60 Hz)/45 rpm (High Speed Craft)
FCR-2827W(-D): 24 rpm
FCR-2837SW(-D): 21 rpm (50 Hz)/26 rpm (60 Hz)

2.2 Transceiver

Frequency X-band: 9410 MHz ±30 MHz
S-band: 3050 MHz ±30 MHz

Output power FCR-2117(-BB,-D)/2817(-D): 12 kW
FCR-2127(-BB,-D)/2827(-D): 25 kW
FCR-2137S(-BB,-D)/2837S(-D)/2837SW(-D): 30 kW
Unwanted emissions comply with ITU-R RR.

Pulselength, PL, PRR and range

| Pulselength | S1 | S2 | M1 | M2 | M3 | L |
|---|---|---|---|---|---|---|
| PL (µs) | 0.07 | 0.15 | 0.3 | 0.5 | 0.7 | 1.2 |
| PRF (Hz) | 3000* | 3000* | 1500 | 1000 | 1000 | 600** |
| Range scale(nm) | 0.125, 0.25, 0.5, 0.75, 1.5 | 0.5, 0.75, 1.5, 3 | 0.75, 1.5, 3, 6 | 3, 6, 12, 24 | 3, 6, 12, 24 | 6, 12, 24, 48, 96 |

*: 2200 Hz with ARPA on 32 nm range **: 450 Hz on 96 nm range

IF 60 MHz

Noise figure X-band: 6 dB, S-band: 4 dB

Duplexer Ferrite circulator with diode limiter:
FCR-2117(-BB,-D)/2127(-BB,-D)/2137S(-BB,-D)/2817(-D)/2827(-D)/2837S(-D)
Ferrite circulator with TR limiter:
FCR-2827W(-D)/2837SW(-D)

2.3 Display-related specifications

Minimum range 20 m w/raw video + 0-2 m w/digitize error

Range discrimination 20 m w/raw video + 0-6 m w/digitize error

Range scales (nm), range ring interval
0.125 (.025), 0.25 (0.05), 0.5 (0.1), 0.75 (0.25), 1.5 (0.25), 3 (0.5), 6 (1), 12 (2), 24 (4), 48 (8), 96 (16)

Range accuracy Within 1% or 10 m, whichever is greater

Bearing discrimination 1.5° (XN20AF), 1.2° (XN24AF), 2.5° (SN30AF), 2.0° (SN36AF)

Bearing accuracy ±1°

Radar map Route, coastline, buoy, etc. 20,000 pts. in radar mode, 6,000 pts. in chart mode (using IC card)

ARPA/ATA Acquisition: 0.1-32 nm, 100 targets (auto and/or manual, selectable from menu)
Vector time: 7 times (OFF to 30 m)
Time from acquisition to display: within 60 s at 24 rpm
Trail maneuver available

AIS Complies with IMO SN CIRC. 217, IEC60936-5
- Max. no of targets 200 targets; Safety messages: 100
- Safety msg input Address-specific, all ships
- Data display Ship's name, call sign, L/L, range, heading, course, speed, CPA/TCPA, BCR/BCT, ROT, IMO no., MMSI no, etc.

## 3. ECDIS

| | | |
|---|---|---|
| 3.1 | Display contents | |
| | Chart materials | IHO/IMO S57 edition-3 ENC vectorized material |
| | Own ship display | Own ship mark and numeral indication or lat/lon, speed and course |
| | Other ship display | ARPA target mark and numerical data<br>(range and bearing from own ship, course, speed, CPA, TCPA) |
| | Other data | Route, waypoint, nav line, electronic chart, various alarms |
| 3.2 | Other display features | Chart zoom in and zoom out |
| | Cursor | EBL, VRM, parallel cursor |
| | One-touch restore | One-touch restore of standard mode |
| | Chart data | Select to show applicable data |
| 3.3 | User interface | |
| | Position fixing | - Navigation by position from external EPFS<br>- Dead reckoning by gyro, log<br>- Kalman filter determines best position from gyro data and EPFS |
| | Navigation planning | - Planning by Rhumb line, Great circle<br>- Route creation<br>- Route data may be transferred to radar<br>- Route data may be transferred from ECDIS |
| | Route monitoring | - Off-track display<br>- Waypoint arrival alarm<br>- Shallow depth alarm |
| | User chart | User chart creation (Max. 2000 lines, 1000 symbols), with overlay |
| | MOB (Man Overboard): | Position, etc. at time of man overboard are recorded and MOB mark is displayed on the screen. |

## 4. I/O

| | | |
|---|---|---|
| 4.1 | Heading data | Built-in interface (option) for sync signal (20-135 VAC, 50-400 Hz), or stepper signal (20-100 VDC), any polarity, for gyrocompass, GPS compass SC-60/120 by IEC 61162-2 |
| 4.2 | Speed signal | IEC 61162-1 |
| 4.3 | AIS interface | IEC 61162-1, ABM, BDM, etc. |
| 4.4 | Input sentences | BWC, BWR, DBS, DBT, DPT, DTM, GGA, GLL, HDT, RMA, RMB, RMC, RTE, VBW, VDR, VHW, VWR, VTG, VWT, MTW, MWV, WPL, ZDA (IEC 61162-1) |
| 4.5 | Output sentences | TLL, RSD, TTM, AAM (IEC 61162-1) |

# 5. POWER SUPPLY

5.1 Display unit — 100-230 VAC, 1ø, 50/60 Hz, 0.6-0.3A

5.2 Radar units

FCR-2117(-BB,-D)/2817(-D):
100-115 VAC, 1ø, 50/60 Hz: 2.6A[1]/3.0A[2]
220-230 VAC, 1ø, 50/60 Hz: 1.6A[1]/1.7A[2]
FCR-2127(-BB,-D)/2827(-D):
100-115 VAC, 1ø, 50/60 Hz: 3.0A[1]/3.4A[2]
220-230 VAC, 1ø, 50/60 Hz: 1.8A[1]/1.9A[2] [1]24 rpm, [2] 42 rpm
FCR-2137S(-BB,-D)/2837S(-D)/2837SW(-D):
100-115 VAC, 1ø, 50/60 Hz: 3.0A[1]/3.0A[2]
220-230 VAC, 1ø, 50/60 Hz: 1.7A[1]/1.7A[2]
FCR-2827W(-D):
100-115 VAC, 1ø, 50/60 Hz: 3.2A (24 rpm)
220-230 VAC, 1ø, 50/60 Hz: 1.8A (24 rpm)

5.3 Chart processor unit — 100-230 VAC, 1ø, 50/60 Hz: 1.5A-0.5A

5.4 Switching hub — 100-230V AC, 1ø, 50/60 Hz: 0.1A

5.5 S-band antenna

| Model | Antenna voltage input (at wind speed 100 kt) | | | | |
|---|---|---|---|---|---|
| | 200 VAC, 3ø, 50 Hz/ 220 VAC, 3ø, 60 Hz | 380 VAC, 3ø, 50 Hz/ 440 VAC 3ø, 60 Hz | 220 VAC, 3ø, 50 Hz (HSC) | 220 VAC, 3ø, 60 Hz (HSC) | 440 VAC, 3ø, 60 Hz (HSC) |
| FCR-2137S(-BB,-D) | 3.0A | 1.5A | 3.5A | 3.5A | 1.7A |
| FCR-2837S(-D) | 3.0A | 1.5A | 3.5A | 3.5A | 1.7A |
| FCR-2837SW(-D) | 3.0A | 1.5A | - | - | - |

# 6. ENVIRONMENTAL CONDITIONS

6.1 Useable temperature range

Antenna unit — -25°C to +55°C (storage +70°C)

Display unit, processor units, control unit, power supply, transceiver — -15°C to +50°C

6.2 Relative humidity — 93±3% at 40°C

6.3 Waterproofing

Antenna unit — IPX6 (IEC 60529)

Display unit, processor units, control unit, power supply: IPX0 (IEC 60529)

Switching hub — IPX0 (IEC 60529)

6.4 Vibration

- From 2 Hz to 5 Hz to up to 13.2 Hz with an excursion of ±1 mm ±10%
- 13.2 Hz to 100 Hz with a constant maximum acceleration of 7 m/s$^2$

## 7. COLOR

| | | |
|---|---|---|
| 7.1 | Display unit | Chassis: 2.5GY/1.5, Panel: N3.0 |
| 7.2 | Chart processor unit | 2.5GY/1.5 |
| 7.3 | Control unit/Switching hub | N3.0 |
| 7.4 | Antenna unit | N9.5 |
| 7.5 | Power processor unit | 2.5GY/1.5 |

## 8. PERFORMANCE MONITOR

8.1 PM-31 (X-band)

| | |
|---|---|
| Frequency | 9365-9455 MHz |
| Input power | Min. +8 dBm, Max., +28 dBm |
| Power output | -36 dBm (2-phase pulse max output) |
| Power output | -56 dBm (2-phase pulse max output) |
| Level difference | 9.0-11.0 dB (1-phase pulse, 2-phase pulse) |

8.2 PM-51 (S-band)

| | |
|---|---|
| Frequency | 3020-3080 MHz |
| Input power | Min. +5 dBm, Max., +15 dBm |
| Power output | -15 dBm (2-phase pulse max output) |
| Power output | -35 dBm (2-phase pulse max output) |
| Level difference | 9.0-11.0 dB (1-phase pulse, 2-phase pulse) |

## 9. SWITCHING HUB

| | | |
|---|---|---|
| 9.1 | Access | CSMA/CD |
| 9.2 | Transmission speed | Half duplex: 100 Mbps/100 Mbps<br>Full duplex: 20 Mbps/200 Mbps |
| 9.3 | Necessary cabling | 10BASE-T: STP cable, category 3 or better<br>100BASE-TX: STP cable, category 5 or better |
| 9.4 | No. of ports | 8 ports, all ports comply with Auto-MDIX |

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# Declaration of Conformity

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We FURUNO ELECTRIC CO., LTD.

(Manufacturer)

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(Address)

declare under our sole responsibility that the product

MARINE RADAR/ARPA FCR-2XX7 series

(Model name, type number)

to which this declaration relates conforms to the following standard(s) or normative document(s)

| | |
|---|---|
| IMO Resolution MSC.64(67) Annex 4 | IEC 60936-1 Ed. 1.1: 2002 |
| IMO Resolution MSC.191(79) | IEC 60936-2 Ed. 1.0: 1998 |
| IMO Resolution MSC.192(79) | IEC 60936-3 Ed. 1.0: 2002 |
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| IMO Resolution A.823(19) | IEC 61162-1 Ed. 3.0: 2007 |
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